THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 655.] LONDON, NOVEMBER 30, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

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SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
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WELL-SEASONED PLANKS.
SCRUBBERS FITTED WITH MR. LIVESEY'S BOARDS AT MODERATE COST.
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Coal Office,
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JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
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COMMERCIAL STREET, SPITALFIELDS;
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J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
Lists may be obtained on application to
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JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
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CONTRACTORS
FOR THE
ERECTION OF NEW & REMODELLING OF EXISTING GAS-WORKS.
RETORT-SETTING A SPÉCIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
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THE
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DUKE OF HAMILTON'S
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CANNEL COAL.
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GEORGE GLOVER & CO.,

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IMPROVED DRY GAS-METERS,

WARRANTED TO MEASURE CORRECTLY, AND NOT TO VARY.

EXTENSION OF PREMISES.

G. G. & Co. having had their premises entirely rebuilt, are now fairly in possession of large and commodious workshops, specially adapted to the requirements of the trade, and they are prepared to execute orders, large or small, with promptness and despatch.

THEY KEEP IN STOCK METERS OF ALL SIZES, UP TO 300 LIGHTS.

RANELAGH WORKS, RANELAGH ROAD, PIMLICO,
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Mr. A. DEMPSTER, POST-OFFICE PLACE, MELBOURNE.

G. G. & Co. have just been awarded a SILVER MEDAL for Gas-Meters and Gas Apparatus at the Exhibition of the "Society for the Promotion of Scientific Industry," Manchester.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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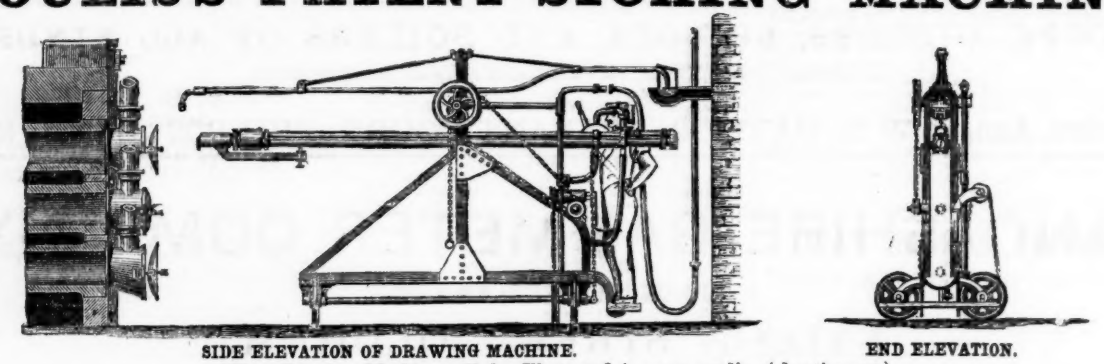
FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE. END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz; Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

Established

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THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

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FIRE GOODS, and Salt-Glazed Drain-Pipes.

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Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

TRADE MARK

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

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(Established 1822,)

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PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON STREET, OLDHAM,

MANUFACTURERS OF

GAS-METERS, GOVERNORS, EXPERIMENTAL GASHOLDERS, &c.

HENRY THOMAS, Managing Director.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

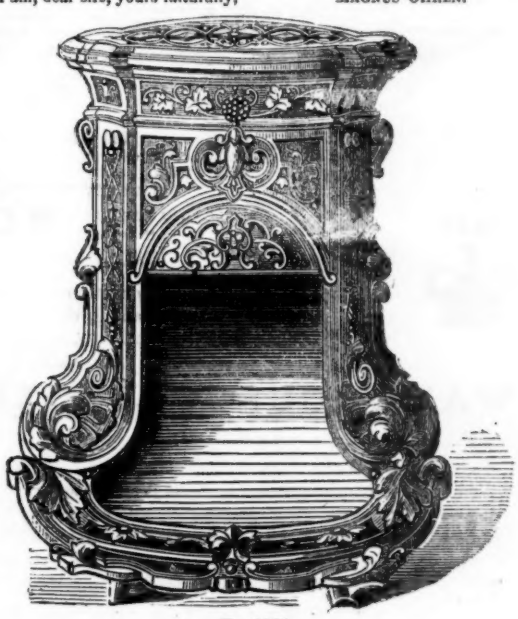
BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.



No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,

Has all the appearance of a Bright Fire.

PRICE from 32s.

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

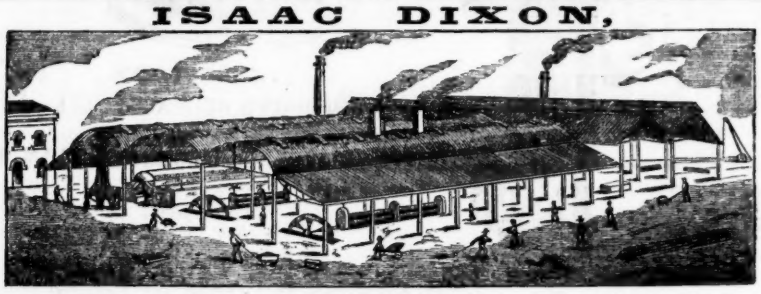
The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

ISAAC DIXON,

WINDSOR IRON-WORKS, LIVERPOOL.



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Manufacturer of **SELF-SUPPORTING GALVANIZED CORRUGATED, CURVED,** and every kind of **IRON ROOFING, CHURCHES, SCHOOLS, SHEDS,** and **IRON BUILDINGS.**

WROUGHT and **CAST IRON GIRDERS, BRIDGES, TANKS, &c.,** and all kinds of **WIRE WORK, FENCING, GATES, HURDLES, &c.,** for Home or Abroad.

DIXON'S CELEBRATED SELF-SUPPORTING IRON ROOFS are specially suitable for Forges, Rolling-Mills, Iron-Works, Shipbuilding Yards, Mines, Collieries, Gas and Water Works, and for general purposes.

For Roofs with Timber Framing, DIXON'S GALVANIZED OR TARRED IRON SLATES form a durable and cheap covering, costing only about the same when fixed, as felt and boards.

DRAWINGS, ESTIMATES, AND ILLUSTRATED CATALOGUES MAY BE OBTAINED ON APPLICATION.

MANCHESTER EXHIBITION GOLD MEDAL 1875 SCIENTIFIC INDUSTRY

SIDNEY LEONI & CO.,

GAS ENGINEERS,

Patentees and Manufacturers of Registered Apparatus for Cooking and Heating by Gas, Complete Kitcheners for Families, Hotels, Clubs, &c. Ovens for Baking and Roasting. Grillers for Broiling. Boilers and Steamers for general use. The New Patent Tubular Safety Gas Boiler; also Heating and Ventilating Stoves, besides other Culinary and Warming Apparatus of their invention, and for which they have been awarded Prize Medals in 1871, 1872, 1873, and 1874.

They have also just been awarded by the Jurors of "The Exhibition of Appliances for the Economy of Labour," now being held at Manchester, the

GOLD MEDAL

For their collection of Patent Atmospheric Gas Apparatus, comprising New Patent Kitcheners for Roasting, Baking, &c., Steamers, Bath Boilers, Heating and Ventilating Stoves, Ornamental Drawing and Dining-room Fire Grates, and other Gas Apparatus, for their novelty, design, workmanship, and utility.

For Pamphlets on the "Advantages of Cooking and Heating by Gas," and Price Lists, &c., apply at the

Adamas Works, 54 to 66, ST. PAUL'S ST., NEW NORTH RD., LONDON, N.

London Depot: 74, STRAND, ADELPHI, W.C.,

Sole Licensees and Agents in Great Britain for

GIROUD'S PATENT RHEOMETER.

This Instrument is easily fixed under any burner; it regulates the volume of gas to be consumed, notwithstanding the size of the burner or the variations of pressure.

PRIZE MEDALS, 1862, 1867, 1871, 1874, 1875.

SOLE AGENTS and MANUFACTURERS of LOOKER'S PATENT WARMING and VENTILATING GAS-STOVES.

(Special Illustrations and Prices on application to our Works.)

S LEONI & Co

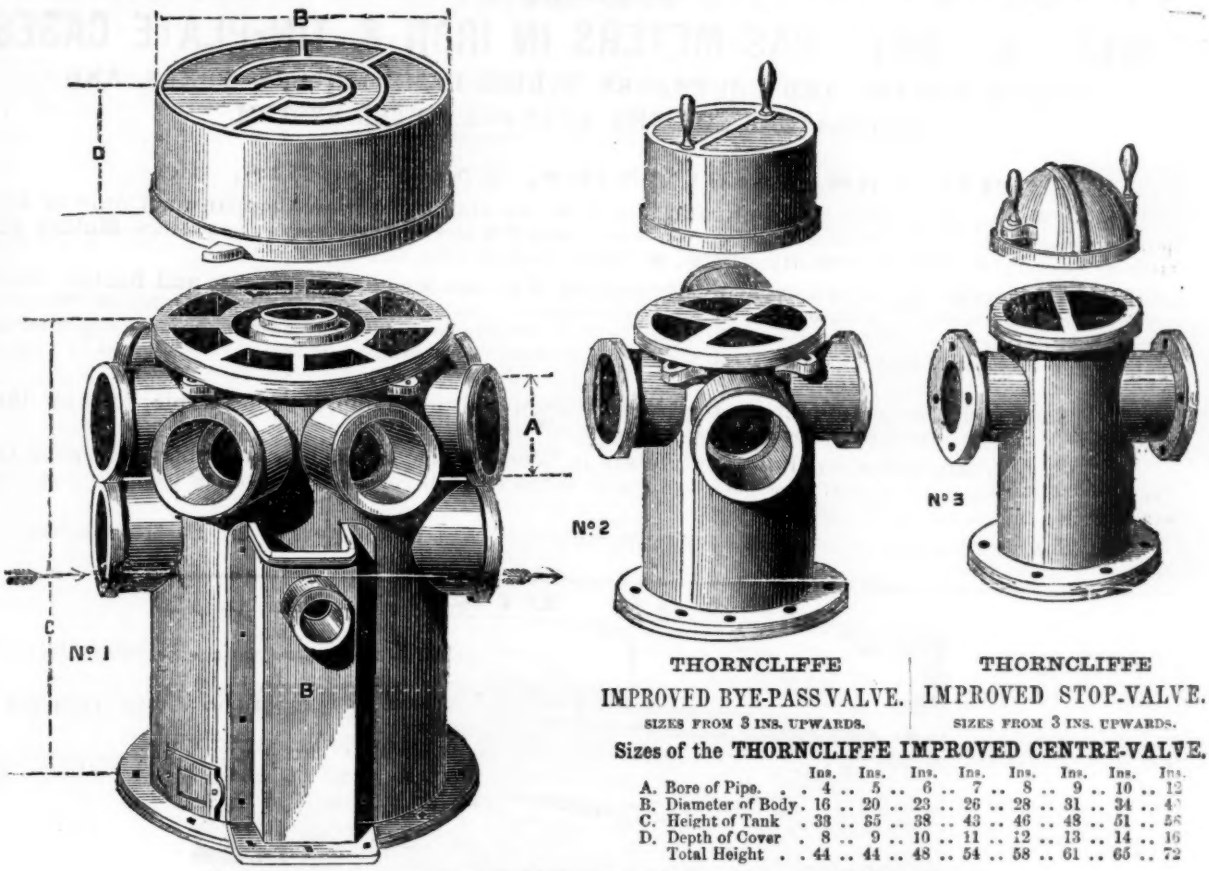
MANUFACTURERS TO THE METROPOLITAN DISTRICT ASYLUM BOARD, TO THE LONDON, GUYS, ST LUKES & OTHER HOSPITALS, ST PAULS CATHEDRAL SCHOOLS AND MARLBOROUGH COLLEGE &C

TO THE EMPRESS OF AUSTRIA THE COUNT OF FLANDERS &C

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body .	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	4[illegible]
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

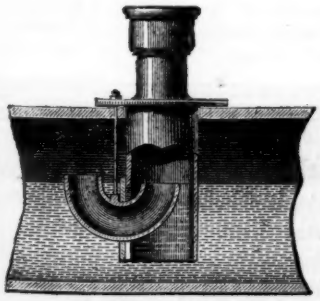
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

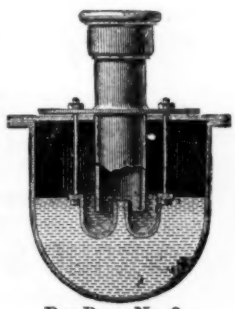
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



DIP-PIPE, No. 1. *FOR PRICES, TESTIMONIALS, &c., APPLY TO* DIP-PIPE, No. 2.

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

WILLIAM SUGG,

GAS ENGINEER,

VINCENT WORKS, VINCENT STREET,

WESTMINSTER, S.W.

PUBLIC LIGHTING

ON THE

AVERAGE METER SYSTEM.

LAMP METERS, IN CAST-IRON BOXES,

FOR

Fixing in the Footway, flush with the Pavement, with roughed Lids.

NOTE. — These meters were originally invented by William Sugg, in conjunction with Mr. Thos. Hawksley, Past-President of the Institute of Civil Engineers. They have been in use at Nottingham since 1866, and are still at work. The Gaslight Company and the Corporation were both quite satisfied with the results.

They were also introduced at Folkestone in 1869 by the late Mr. T. G. Barlow, Editor of the JOURNAL OF GAS LIGHTING. The success of the system put an end to a very long and troublesome dispute between the Gas Company and the local authorities. They are still at work with the same satisfactory results.

They have since been used in several important towns, with equally good results.

No other kind of Lamp Meter has ever achieved so complete a success.

Mr. Ellice Clark, C.E., at a recent meeting of the Association of Municipal and Sanitary Engineers and Surveyors, read a paper "On the Average Meter System." Referring to Folkestone, he said that—"The Average Meter Indicator system has been in operation the last five years, and found to act well. Sugg's Self-Acting Regulator is used, adjusted as nearly as may be practicable to consume 4 feet per hour, and so very satisfactory is this apparatus, that for the last two years, after burning 7294 hours, it is found by the Average Meter to have consumed 29,227 feet, as against 29,176 feet as per Regulator, being only 51 feet in excess of that which the apparatus is adjusted to consume."—*See* JOURNAL OF GAS LIGHTING, *May* 18, 1875, *page* 728.

LEVER COCKS FOR POLE LIGHTING,

STRONG AND SERVICEABLE.

These Cocks are carefully made so as to avoid Stoppage by Naphthaline, Leakage, and Friction.

WILLIAM SUGG'S

PATENT PUBLIC LAMP GOVERNOR,

WITH

STEATITE INCORRODIBLE BURNERS.

Guaranteed to give the greatest amount of light for the quantity of gas consumed.

The amount of light for a like quantity of gas is at least 30 per cent. over that given by those burners generally employed in public lighting.

NOTE.—Many of William Sugg's original Governors first applied to public lamps are still at work in the Imperial Gas Company's Districts, where they have been in constant use, with very slight repairs, now more than 14 years.

Upwards of 400,000 of these, and those of William Sugg's later inventions, are in use in various parts of the globe.

The Patent Lamp Governor is especially serviceable for home and foreign use. It can be taken to pieces, new leathered, and put together again in a few minutes by any ordinary workman.

By the principle of Double Regulation, a finer and steadier light is secured with the greatest illuminating power, and the least loss of gas in case of the breakage of a burner.

This system can be readily applied to all Lamp Governors, new or old.

TESTIMONIAL.

HAMILTON GASLIGHT COMPANY,
Hamilton, Ontario, Sept. 9, 1875.

Dear Sir,—Enclosed please find draft in settlement of your account for Street-Lamp Regulators supplied to this Company. I have much pleasure in informing you that they give us great satisfaction. I was somewhat in fear that they would not stand the severity of our Canadian winters without freezing, but I find they do well.

I am, dear Sir, yours very truly,
T. LITTLEHALES,
Engineer and Manager.

Mr. W. Sugg.

WILLIAM SUGG'S

POLE LIGHTERS

Are acknowledged to be the best of their kind, and are almost universally adopted.

This is one of the spécialités of the house.

LANTERNS VERY STRONG, WITH PORCELAIN TOPS.

MODERN STREET LIGHTING,

BY WILLIAM SUGG, A.I.C.E.

Price 1s. 6d.

WILLIAM SUGG,

GAS ENGINEER,

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

CLYDE TUBE WORKS, GLASGOW & COATBRIDGE.

OFFICES, 41, OSWALD STREET, GLASGOW,

ANDREW & JAMES STEWART,

MANUFACTURERS OF

WROUGHT-IRON WELDED TUBES AND FITTINGS,

GUN METAL & OTHER COCKS, ALL KINDS OF IRON & BRASS FITTINGS

For GAS, WATER, and STEAM;

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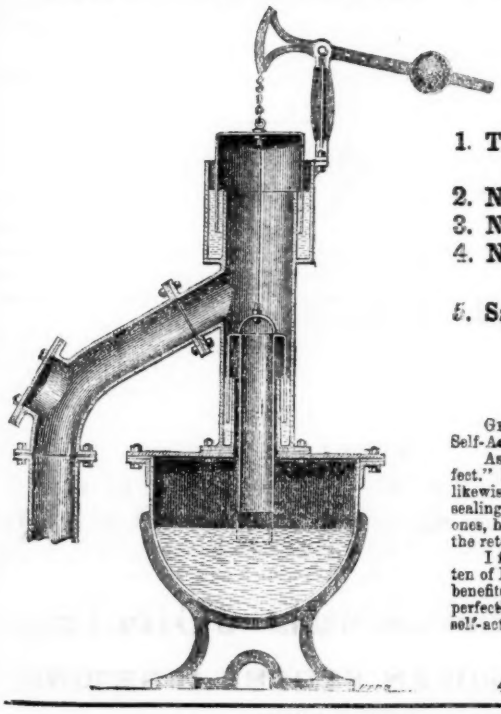

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Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 30, 1875.

Circular to Gas Companies.

THE parliamentary notices of the leading metropolitan gas companies will be studied with close attention. Although the specific designs of the intended Bills are, in some particulars, only loosely hinted at, enough is said to clearly reveal the general objects of the measures proposed.

The Chartered Company, in the first place, are desirous to obtain powers for the acquisition of, collectively, a large area of land; part of it for the extension of their western works, which will soon be urgently required, and a part to provide for the further enlargement of the eastern establishment, the necessity for which must be looked forward to, and the land to allow of it obtained. As the value of the property at both extremities of the Chartered district rapidly advances year by year, the earliest possible acquisition of the land is desirable, in the interests of company and consumer.

In the notice now referred to, there is a paragraph which seems to hint at the possibility that the Chartered Company contemplate operations for the utilization of residual products. We should regard this, if really intended, as a step in the right direction. Supposing the amalgamation now proposed *un fait accompli*, the United Company will equal, if not surpass, in importance the Paris Gas Company. Now, the latter company make their own retorts and fire-bricks, distil their tar, manufacture sulphate of ammonia and artificial fuel, and do other things that add to the profits which would be made by the supply of gas alone. We are inclined to think the "United Company" might follow the example of the Paris Company with advantage. Retorts and fire-bricks could not be profitably manufactured at Beckton; but residuals, we fancy, might be worked up there with as much success as at Paris.

It does not appear that the company desire to add to their share capital, but, taking their cue from recent proceedings, they wish for enlarged borrowing powers, the money raised being entitled to priority, or preference, in regard to the payment of interest thereon. The next part of the paragraph announces the willingness of the company to accept the sliding scale. Now, we have great misgivings as to the effect of the sliding scale, in conjunction with an exaggerated amount of debenture bonds, on the holders of ordinary shares. We can imagine circumstances not at all unlikely to arise, in which the interest on preference shares and mortgages may swallow all the profits, and that portion of the capital which may be said to have borne the burden and heat of the day, may receive next to nothing. Ordinary shareholders in some railways, and other undertakings, will understand our meaning. There are, of course, gas companies in which no such contingency is to be anticipated; but there are others, we take it, in which, under certain eventualities, it is not at all unlikely to occur, and people who have recently bought £100 worth of gas stock for £205, may be greatly disappointed in the results of their investment. In fact, the position of the ordinary shareholder under the sliding scale becomes a very precarious one, having regard to the future. But more on this point presently.

The Chartered Company also propose an amendment of the City of London Gas Act, 1868, which will allow the insurance-fund, created under the authority of that Act, to be applicable alike to the equalization of dividends, and the purposes for which it was originally granted. The desire on their part is quite reasonable, but the answer the authorities will make is very obvious. The last thing they wish to provide for is the equalization of dividends. No remark need be made on the remaining part of the Chartered Company's notice.

The Imperial Company have also given notice of a Bill, which will, we presume, be proceeded with, if the amalgamation scheme, now under the consideration of the authorities, fall through. The notice is more vague than usual; but the proposed measure is to provide for a general amalgamation by agreement, and also to give power to raise new capital, share and loan. No intimation of an acceptance of the sliding scale is to be found in this notice, so we take it that the directors of this company would prefer to stand on the old ways.

The notice of a Bill to be promoted by the South Metropolitan Company, of course, finds a place in the *Gazette*. The first wish of the company appears to be to get repealed the sections of their Act of 1869, which relate to the penalties recoverable with respect to the illuminating power and purity of their gas, and to the mode of testing such power and purity. What this may portend, it is impossible to say. Possibly 16-candle gas, with any amount of the so-called impurities. It is also desired to increase the capital of the company by the issue of new shares or stock, preference or other, and by borrowing. Some alterations in the internal arrangements of the company seem to be contemplated, but with these we need not concern ourselves. The Bill will, of course, adopt the sliding scale, subject to the fixing of a standard price; and will propose some provisions with respect to reserve or insurance funds accumulated or to be accumulated. Lastly, the South Metropolitan Company ask for general powers of amalgamation, as conferred by the City of London Gas Act. Whether this Bill be proceeded with or not, depends, we may suppose, on the fate of the Regulations Bill, which measure, however, will not exactly answer the purposes of the company as regards reserve or insurance fund.

Taking all these notices together, and for the moment overlooking possible accidents on Standing Orders, and other incidents, which may exclude the measure proposed from consideration by

Parliament, we see sufficient work cut out for another select committee, and precedents are not wanting for the appointment of a second committee on metropolitan gas questions.

The Board of Trade, as it is called—though no one connected with it, from the President to the messengers, we believe, has ever had the smallest practical experience in trade, unless some subordinate is on the direction of the Civil Service Co-operative Association—have sent the scheme proposed for the amalgamation of the Chartered and Imperial Companies to the metropolitan local authorities for consideration, with a request that attention should be given to it at once. This request was soon followed by another letter from one of the permanent officials, stating that the Board would not be justified in approving the amalgamation, unless they were satisfied that proper steps would be taken for the protection of the consumer; which appears to mean that they wish the Metropolitan Board to insist on the adoption of the sliding scale. Mr. Farrer also suggests that any further capital required by the companies should be raised by *borrowing at the lowest rate at which money can be procured*, rather than by shares bearing a *high rate of interest*. The "high rate "of interest," thanks to Lord Redesdale, now allowed on a risky manufacture like that of gas, is 7 per cent. on ordinary, and 6 per cent. on preference shares. Suppose that all future capital is raised by way of loan, and that, in the course of time, gas should be superseded by some other illuminating agent, why it is clear that the present shareholders would be beggared, and the lenders come off triumphant. It may be suggested that the shareholders might insure themselves by becoming lenders, but we must ask some actuary to calculate how much must be lent to insure a given amount of share capital.

We shall not attempt to disguise our opinion that the interference of the permanent officials of the Board of Trade in this matter is quite uncalled for. With a *fainéant* president, like a duke or a baronet, whose riches lie in broad acres, and who knows nothing of manufactures or commerce, the permanent officials can do as they please. But they did not play these tricks when Mr. Bright was President of the Board of Trade. With a president, however, who knows how to squeeze a company, if they put up a chimney which overtops the tallest trees in his park, what can be expected? We need hardly say that we have still some faith in a Parliament and Government brought into existence to stop the "harassing" of all interests and industries in the kingdom.

Mr. Newton affects to believe that 3s. 9d. per 1000 feet is too high a standard price to start with for the sliding scale. If we thought he was in earnest, a suspicion would cross our minds that some people might think him ungrateful. But we do not believe he is in earnest. A common dodge to earn popularity is to ask for something impossible, and, when failure comes, to explain "that no one but those behind the scenes knows the difficulty "there is in successfully fighting vested interests," or something to that effect. We could mention several politicians whose fame rests entirely on a practice of this kind. Mr. Newton may suggest a three-and-sixpenny standard, but we fancy he knows very well that he cannot get it, and, moreover, does not wish for it. The select committee, last session, decided on 3s. 9d., and, Mr. Newton notwithstanding, we believe that, if any change be made next session, it will be in an upward direction. Mr. Farrer evidently considers the "initial price" an open question; and, in the absence of general amalgamation, we think we may assume that, a differential initial price is still on the cards, notwithstanding the expression of opinion on the part of Mr. Forster's committee.

We have often said, and may repeat, that the gas question of to-day is not exclusively metropolitan. There are consumers to be "protected," and companies to be "harassed" or advantaged, all over the kingdom. If the Regulations Bill should become law, some alteration must be made in the general Acts, or, at all events, when any provincial company apply for fresh powers, the sliding scale must be introduced. Why should the Plymouth, Bath, York, and British Company (at Hull), who, not better circumstanced than the London companies, nevertheless supply gas so cheap, be inexorably tied down to a 10 per cent. dividend? The Board of Trade must look to this. We may be told that the cases are not identical. It is so; but all the metropolitan companies are not similarly circumstanced, and yet the Regulations Bill, promoted by the metropolitan local authorities, alters profoundly the provisions of the general Act of 1860, under which some of the companies still work. The question is an extremely difficult one, and we do not attempt any solution. Our object will be attained if we succeed in fixing the attention of the provincial companies on the sliding scale, and the consequences which may result from its general adoption. For our own part, we entertain as strong an objection as ever to the introduction of a principle of settling dividends which is not commercial, and which is not (now, at all events) legal.

The Corporation of Birmingham have a ready command of money. Our readers will remember that the consideration for the purchase of the Birmingham and Staffordshire Gas Company was perpetual annuities, equal to maximum dividends. The Corporation have, however, given notice that they are willing to buy up these annuities at once, at the rate of 24 years purchase. It is a year less than might have been expected; still, £240 for £100 invested in the gas undertaking is not a bad offer. At the present price of Consols, the purchase-money, invested in Government securities, will yield about £8 per annum; and there are other securities, considered sound, in which the money may produce something more than the £10. The difficulty to-day, with people who have money to invest, is to know what to do with it. Speaking recently with an old lady who owns a considerable amount of 10 per cent. stock in a metropolitan gas company, of the possibility of purchase by the local authorities, we were at once met with the anxious question, "But what "shall I do with my money?" The same anxiety will, no doubt, be felt by many of the Birmingham shareholders, and we shall not be surprised if a majority do not decide on holding to their annuities. That the security of the Corporation is considered good in financial circles, is proved by the fact that, they are able to raise, at a very moderate rate of interest, the large sum necessary to purchase these annuities.

The troubles of the Corporation (if we may venture to call them so), in relation to their gas undertaking, are just about to begin. We mentioned last week that the Local Board of Smethwick, and the Commissioners of West Bromwich, were moving to purchase the portions of the undertaking within their respective districts. Tipton and Oldbury also, we believe, are joining in the movement. Cannot all these Boards arrange with the Corporation of Birmingham, to take gas in bulk for the supply of their districts? The multiplication of works looks to us like a waste of money. Birmingham is already in possession of the whole undertaking, with all its present and prospective advantages, and the outlying districts will have to pay dearly for their portions. A compromise is surely possible, with such a man as Mr. Chamberlain to control the negotiations.

The South Shields Gas Company are about to raise a further amount of capital, under the power granted by their Act of 1867. They stand in an enviable position, inasmuch as they appear to give perfect satisfaction to their customers. By judicious enterprise they have provided for the rapidly-growing wants of their districts; but have only made extensions as they promised to be remunerative. The same favourable relation of revenue to capital could not, the chairman said at the recent meeting, be expected for the next two or three years; but the company have a very respectable reserve-fund to fall back upon, and the further expenditure now contemplated will not at all prejudice the interests of consumers. The gas supplied, we may add, is excellent, as regards illuminating power, and exceptionally free from "impurities." The price is a little below that in the surrounding districts.

The Maryport Trustees, who have a gas undertaking of their own, are anxious to acquire that of the gas company. They have the power to compel the sale of the company's undertaking; but the price must be settled by arbitration, and everybody to-day shrinks from arbitration. It seems clear that, if the trustees are in earnest, now is the time to buy. The company must very soon extend their works, and for these extensions, and prospective profits from them, the trustees will have to pay.

To say the truth, we are quite sick of the gas squabble at Swansea, and so we think must be the townspeople. The Corporation may take our assurance, that they will never obtain power to set up competing works. They may buy up the gas company or leave them alone. On the other hand, something under 12-candle gas is not satisfactory in these days, and the company ought to take steps to improve the quality. The London companies, who are bound to 12 candles, generally supply over 15. If some improvement were made, we have no doubt that the hubbub would cease, for the ratepayers would never consent to place the gas supply in the hands of a Corporation who have failed so ignominiously in the management of their water undertaking.

Water and Sanitary Notes.

The recent inquiry before Colonel Cox, respecting the drainage of the Thames Valley, can only be regarded as a preliminary to a much more extended inquiry, when the Local Government Board have made up the their minds to propose a scheme for a united drainage district. The formation of such a scheme we regard as inevitable. We fully agree with much that was said by Mr. Bailey Denton, at the late inquiry; but so far as we can gather from the published reports of his evidence, his plans are by no means complete. He will have time, before his next examination,

to prepare more distinct information, as to the land obtainable for the purification and utilization of the sewage of the several towns and districts implicated in the scheme, and with that before us, we shall be better able to judge of the merits of his plan, or rather plans.

A most unjustifiable attack has been made on Mr. J. H. Wilson, the chairman of the Water Committee of the Corporation of Liverpool, and who happens to be a meter manufacturer. A charge is insinuated that he is interested in the supply of Mr. Deacon's waste-water meter, and that, for that reason, the use of that valuable instrument is extended in the borough. The fact that Mr. Deacon's instrument has been brought into use in Glasgow and some other large towns in the kingdom, is a sufficient testimonial to its merits, and a perfect justification for Mr. Wilson. The value of the invention to the Corporation of Liverpool is indisputable, and the attack we allude to is, no doubt, prompted by trade jealousy.

We have before remarked that the last report of the Rivers Pollution Commission is warmly praised by those who advocate an extension of the well supply in Liverpool. For the moment, all discussion as to the relative advantages of the Bleasdale and Windermere schemes has ceased, and is not, at present, likely to be revived. The report will probably delay the execution of many other schemes projected—whether to the public advantage or not, time will decide. Not having, as yet, mastered the contents of the bulky volume, we have not pretended to give an opinion as to the value of its contents. The able editor of a London daily once told us that a member of his staff was so clever, that he was able to epitomize the contents of a Blue-Book, after a perusal of the printing on the cover. We cannot pretend to skill or prescience like this, and shall go conscientiously through the volume, before submitting an opinion to our readers.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

LXXIV.

Gasholders.

The subject under consideration would hardly be complete without a reference to the first gasholders erected at the Bow Common Works of the Great Central Company, which, even at the present day, possess some points of interest, more particularly on account of them being, so far as we are aware, the first holders of magnitude constructed without trussing to the roof.

In designing these holders, the engineer, Mr. Croll, evidently studied the strictest economy—considerations which may have induced him to avoid the expensive trussing in the roof; but it must be added, that in seeking this economy, the durability of the apparatus was not sacrificed, as none of the sheets entering into the formation of the holders, are of less thickness than No. 12 gauge, and although this thickness is often now exceeded, yet at the period of the erection of the holders at Bow Common it was rarely adopted.

At the works mentioned there are four of these holders, which were all erected at the same time, and are so close to each other as to allow of the framing of the four being secured together. In the centre is the dry well containing the inlet and outlet pipes, syphons, and valves of the respective holders. The tanks are of brickwork, each 105 feet in diameter, and 25 feet 6 inches deep, built in the manner then usually adopted. The holders are telescopic, having two lifts; the outer is 103 feet 7½ inches in diameter, and 25 feet 6 inches deep at the sides; the inner lift is 101 feet 4½ inches diameter, the two rising, together, a height of 50 feet, independent of a 6 inch seal. The working capacity of each of the holders is 400,000 cubic feet, which, although at the present time, may be regarded as of medium dimensions, yet at the period of their construction, twenty-five years ago, they were about the largest in existence.

The grip attached to the outer holder is made of 5 inch by 5 inch by ⅝ inch angle iron on the outside, and 3½ inch by 3½ inch by ½ inch angle iron on the inside, the bottom and vertical side of the cup being formed of ¼ inch plate, secured with ½ inch rivets, which are countersunk within the cup. The edge of the vertical side is stiffened by 1½ inch half-round iron, secured by ⅝ rivets 12 inches apart. The lower curb is formed of 5 inch by 5 inch by ½ inch angle iron, rivetted at 1¼ inch apart. The bottom and top tiers of plates forming the side are ¼ inch thick, all the rest being of No. 12 Birmingham wire gauge. The sides are stiffened by 24 vertical corrugated bars, bolted to top and bottom curbs, each 6 inches broad, ⅜ inch thick, with corrugation 1 inch deep.

On the top of the grip are fixed 12 slide carriages provided with their corresponding rollers, 12 inches diameter over their flanges, and having grooves to work into guide-rods 3 inches broad. To this are also affixed 36 frames and sheaves, with their rollers, 4 inches in diameter and 6 inches long, for guiding the upper lift. To the bottom curb are attached 36 frames, having rollers 6 inches in diameter.

The inner holder or upper lift has a top curb formed of 5 inch by 5 inch by ⅝ inch angle iron, and on its upper part is rivetted a ring of boiler-plate 12 inches wide and ½ inch thick, in segments of 6 feet long, with butt joints, and lapping pieces secured with rivets. This is strengthened by a ring of 4 inch by 4 inch angle iron, rivetted around the under part of the boiler-plate, 4 inches from its inner edge, thus forming a curb of great lateral strength, which was rendered necessary by dispensing with the trussing of the roof.

Fig. 1.

The hydraulic cup, which is 20 inches deep, is formed of 4 inch by 4 inch angle iron, the bottom and vertical side being boiler plate, ¼ inch thick, and strengthened at its vertical edge by 1½ inch half-round iron.

The sheets of the sides are ¼ inch thick for the bottom and top tiers, the rest being No. 12 gauge, and supported by 24 trussed rods, placed at equal distances around the holder, and bolted to the top and bottom curbs. These trussed bars are of 4 inch by ½ inch flat bar, stiffened with ⅝ inch round rod, having a double-acting screwed collar in the middle. The top of the holder is provided with 12 slide carriages, with their rollers 18 inches diameter over the flanges, having grooves to work in guide-rods 3 inches wide.

There is neither king post, main nor secondary bars, nor purlins entering into these constructions; the roof, when the holder is down, reposing on timbers within the tank.

Each holder is supported by 12 guide-rods, 53 feet high, which are attached to an open-leafed framing or tripod, represented in side view in fig. 1, and in plan by the letter T.

These guide frames are cast in three separate lengths with flanges, and bolted together, and are so constructed that there is a width of never less than 4 inches of metal in all the various parts of the frame. The whole of the guide frames are secured together around the circumference by 6 inch T wrought-iron girders. They are further secured to each other at four points, thus uniting the framing of the four holders. The weight of each holder is about 96 tons, and that of the tripods and braces about 45 tons, each tripod weighing three tons. This substitute for columns has been advocated by some engineers on the score of economy, but, as it has been rarely applied, we may assume that no particular advantage is to be derived therefrom.

These vessels have now been in operation nearly 25 years, without causing the slightest regret that their internal roof trussing was dispensed with, a sufficient proof, if any be wanting, of the inefficiency of this appendage. Since that period the system has been adopted with complete success by various engineers and manufacturers; it, therefore, follows that, when economy is a consideration, or where capital is limited, the untrussed roofs of holders can be adopted with advantage.

We now arrive at the question of the three-lift holder, of which there are but very few in existence. Perhaps the earliest of these structures is the one erected at the Surrey Consumers Company's works at Rotherhithe in 1852. The site of the tank for this holder was within 300 yards of the Thames, 8 feet below high-water mark, and close upon a mill stream. The ground was porous, and the appliances now existing for this class of work were not then thought of. In excavating, water was found at about 4 feet from the surface, and, to save expense, it was determined to build the tank of great diameter, in proportion to its depth. It was, consequently, made of 108 feet in diameter and 12 feet 6 inches deep, sunk about 6 feet 6 inches within the ground, and filled in around the sides with the earth taken from the excavation.

The inner lift of this holder, like those at Bow Common, was untrussed, and, as it was so shallow and light, it was determined, in order to get the desired pressure, to make the top curb of cast iron 18 inches wide at the top, and 9 inches deep at the sides, cast in lengths of about 10 feet, and bolted together by internal flanges. The hydraulic cups were also of cast iron, with butt joints and wrought-iron lapping pieces.

The lifts were each 12 feet 6 inches deep, and rose, when full, to a height of 35 feet, having a combined capacity of 300,000 cubic feet. The guide-framing or standards of the tank was formed of open-leafed castings, similar to fig. 1, tapering from 3 feet 6 inches at the base, to 9 inches at the top, and tied all round at the top, and half way down the sides, by horizontal girders and diagonal braces. The rollers worked against the front edges of the standards. The pressure given by the top lift was 3 inches, the two upper lifts 4⅞ inches, and with all the three lifts it was 6½ inches.

An esteemed correspondent, who has favoured us with the particulars of this holder, states that it never worked entirely satisfactorily, a circumstance which he attributes to imperfect construction, or to the shortness of each lift. Of the correctness of the last statement there can be no doubt, for the "play" of the rollers necessary for a holder of 25 feet deep, which would retain it in its proper position, if given to a vessel of half the depth, would cause a tendency to get out of level, and this appears to have been the main difficulty with the holder in question.

From the preceding remarks, it will be seen that three-lift telescopic holders, without counterbalance weights, have been carried into operation; but it must be remembered that the attending circumstances were peculiarly exceptional, the holders only rising to a height equal to one-third of their diameter—no higher, indeed, than many single-lift holders; and although in one sense the shallowness of the vessels was prejudicial, as already explained, on the other hand, their limited height presenting a comparatively small surface to the action of the wind, and their limited pressure were both favourable to the success of the construction. In two-lift telescopic holders the rise is generally equal to one-half the diameter, against one-third with three lifts, as in the holder just described.

In our opinion, therefore, whenever a three-lift holder is adapted to a tank of ordinary depth and diameter, in consequence of the increased elevation and surface, considerable expense and precautions will be necessary in the construction of the frames and indispensable appliances to guide and counterbalance the vessels, which, on economical grounds, would be undoubtedly objectionable. But another still greater impediment to the system is the complication which it involves; and of all the apparatus in a gas-work, there is none where greater simplicity is desirable than in the gasholder. Only, therefore, when land is of a fabulous price, or difficult to be procured, should the three-lift system be applied. It must not be forgotten, however, that 23 years ago, the period when the holder in question was built, our knowledge of the formation of tanks was very limited. At the present day, in such a site, the engineer would construct his tank within a short distance of low-water mark, so that the difficulty which gave rise to this construction may be said to exist no longer. Undoubtedly one of the main considerations was expense, and all was done to avoid this. Thus the trussing in the roof was dispensed with, whilst the shallow sides rendered it unnecessary at those points. The roof was flat—not made with concentric rings of radiating plates, but formed of square sheets, and the hydraulic cups were cast. All of these points favoured in a remarkable manner the cost, which is stated to have been about £3600 for the tank and holder complete, or £12 per 1000 feet for the combined vessels—an amount so small as to lead to the inference that some error exists, or that the contractor lost considerably by the transaction.

At the Fulham station of the Imperial Company, there exists a holder of a capacity of 2,600,000 cubic feet, which we believe is the largest in the world.

Referring to the description given in a recent number of the new gasholders at Bromley, it may be interesting to supply the following additional particulars:—

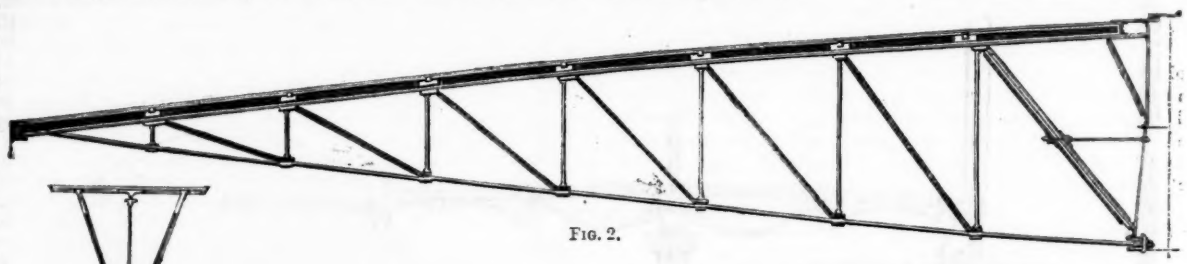


FIG. 2.

FIG. 4.

FIG. 3.

The engraving, fig. 2, represents a side view of one of the main girders of the holder. The centre pipe is a truncated cone, on which one end of the principal strut is supported, the other end "strutting" the main girder. From the top of this strut is suspended the first rod, which supports the second strut, the same action being continued with all the struts and suspension-rods, thus forming a girder of extraordinary strength when compared with the quantity of material employed.

This system of strutting is also employed in the construction of retort-house roofs.

Fig. 3 shows the construction of the secondary rafters, which being only half the length of the former, and, having comparatively little weight to support, are considerably lighter than the others.

The number of main and secondary bars, as well as the rings of purlins, being limited, for a holder of such magnitude, the engineer, Mr. Kirkham, adopted a system, which is represented in fig. 4, of diagonal bracing, in order to support the purlins. These were attached to the rafters, and thus served as struts to the purlins; and when it is remembered that the average surface of unsupported sheets between the girders and purlins is about 900 square feet, the necessity for these braces, when the holder grounds and is without gas to sustain the roof, must be evident.

(To be continued.)

Correspondence.

EXHAUSTERS AND THE DEPOSIT OF CARBON IN RETORTS.

SIR,—I have read with considerable interest the discussion in your JOURNAL between "Nemo" on the one hand, and Mr. Patterson on the other, on the deposition of carbon in gas-retorts, and the use of the exhauster. I should like, with your permission, to offer a few remarks on both subjects, as I cannot quite agree with Mr. Patterson's views. In his arguments for the substitution of the term "Propeller" for that of "Exhauster," he states that the real use of the exhauster is to give a fresh velocity to the gas. To use Mr. Patterson's own words, "the proper function of the exhausters is to give *new* force to the gas as it issues from the retorts in order to 'propel' it through the mass of purifying materials." I certainly think that this is a very strange view to take of the question. Gas produced by the destructive distillation of coal will, if no measures be adopted to remove it as fast as it is evolved, acquire a pressure largely in excess of that required to merely carry it through the mass of purifying material used. This being the case—and I do not think that Mr. Patterson will deny the correctness of the statement—it is difficult to conceive the possible necessity of having a "propeller" to give "new force" to the current of gas. Derivatively, the term "exhauster" is shown to signify an instrument which "draws or pumps out," and I cannot but think that its application to gas manufacture is in keeping wi h the derivation of the name, for its obvious use is to "pump out" the gas from the retorts as fast as it is generated. The term "exhauster" besides being, in my opinion, correct, has the sanction of long usage, and it is never desirable to alter a technical term of recognized standing without a very powerful reason. So far on the question of exhausters. There is no doubt that the use of these instruments diminishes the deposit of carbon in the retorts, and that the quantity of this deposit, with the same quality of gas, is in direct proportion to the pressure. Mr. Patterson's views on the question of the origin of the carbon deposit, and from what constituents of the crude gas it is derived, is, no doubt, in the main, correct; but at the same time I think that he carries his arguments a little too far, when he states that "nearly the whole (if not the whole) of the said deposit is produced from and out of the tarry vapours," &c. I have no doubt that a large proportion of the carbon deposit is produced by the decomposition of these tarry vapours, which, had they escaped decomposition, would have been condensed in the usual way; but I think that a by no means inconsiderable portion of the "carbon" is also produced at the expense of these richer constituents of the gas, which remain, under ordinary conditions, permanent. How else could we explain the fact of increased yield, and higher illuminating power of the gas produced, when the pressure is kept down in the retort by the use of the exhauster?

All previous experience points to the conclusion that the lower the pressure can be kept in the retort, the greater the gain in illuminating value, and that increase of pressure is attended with a proportionate loss of illuminating power, and at the same time increased carbon deposit. It is likewise well known that the "olefiant series" of hydrocarbons, to which the illuminating power of ordinary gas is supposed to be mainly due, are easily decomposable under the influence of heat, marsh gas or light carburetted hydrogen being formed, and carbon set free. Much more might be said on the subject, but I feel that I have already trespassed too much on your valuable space. "CHEMICUS."

DEPOSIT OF CARBON IN RETORTS.

SIR,—The instructions once given to a barrister to defend a most hopeless cause were:—"No case—abuse the plaintiff's attorney;" and Mr. Patterson, when accusing me of "misstatement and misrepresentations," together with his assertion that my remarks were "unworthy of honest criticism," has admirably imitated the instructions referred to. His language, under any circumstances, is severe, but the more particularly so when, as I will prove, it was totally unjustifiable and uncalled for.

It must be first stated that, so far as I am aware, I have never seen Mr. Patterson, and am only acquainted with him by name, so that any observations made by me were free from all animosity, and intended simply to arrive at the truth. With these remarks, I will now state the facts.

In the first communication made by Mr. Patterson about four weeks ago, he entered into several questions, in which he expressed opinions entirely at variance with those accepted by the profession generally; and, with the belief that his communication was open to fair criticism, and that he had made an error, I had the temerity to question so high an authority, and think I gave good and substantial reasons to justify my assertions.

This brought forth a reply, in which Mr. Patterson mixed up the volatile constituents and the fixed carbon of the coal in such a manner as to give me the impression that he wished to "shirk" the question. But in that communication he referred to the tarry vapours and gas evolved from the coal, and then said that the residuum "coke cannot be converted into gas of any kind." He did not say that no more gas could be extracted from it, but that *the coke could not be converted into gas of any kind;* and I think that no language can be plainer or more definite.

With the impression that the subject was open to "honest" criticism, I quoted literally Mr. Patterson's words, and stated truly that he was in error, and that the coke could be converted into more than one kind of gas; and for this I am charged with making misstatements, misrepresentation, &c. So much for Mr. Patterson's powers of "reasoning" and "logic."

Your correspondent, however, pretends that he meant "coal gas," or gas as the term is usually applied, but this is entirely different from "*gas of any kind;*" and as he had previously referred to the vapours and gas expelled from the coal, and was then alluding to the residual only, his assertion that he meant "coal gas" is not admissible. Moreover, if Mr. Patterson makes erroneous statements, no matter what he intends to say, he renders himself liable to criticism, and should avoid that display of harsh language which gives no force to his arguments, nor dignity to himself.

I would also offer another piece of advice to Mr. Patterson, which he appears much in want of; that is, to make himself conversant with the operations of the retort-house. This done, he will find, among other facts, that the gas does not issue from the coal, as he states, "owing to its

normal weight compared with the air, or its high rarefaction," but simply by the augmented volume attained by the matter, when passing from the solid to the gaseous state, and if the gas were ten times the weight of air, there would be but little difference in the operation of carbonization, at least, so far as concerns the generation of the gas. He will then understand the causes of the production of the tarry vapours and the deposit of carbon in the retorts.

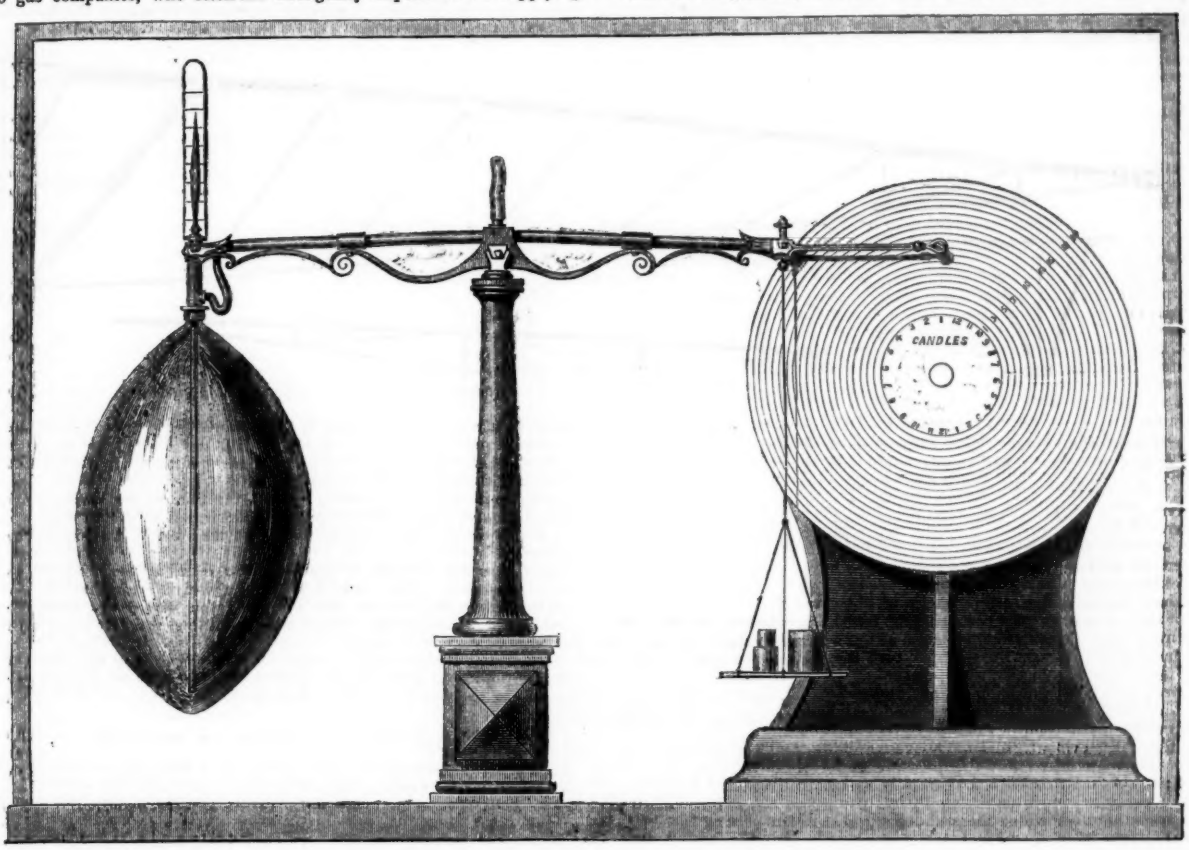
As I have no wish to continue the dispute, this will be my last communication on the subject. NEMO.

[We think this correspondence should now cease.—ED. J. G. L.]

AN AUTOMATON REGISTER OF ILLUMINATING POWER.

SIR,—As a self-acting register of the illuminating power of gas is greatly needed, an instrument which could be depended upon both by the manufacturers and consumers of gas would prove a great boon, both to gas companies, who often are wrongfully impeached for supplying inferior quality, and to consumers generally, who, as a rule, have very little faith in the reports issued from time to time by duly appointed and qualified inspectors. There are constant doubts and disputes about the errors either in the candles, the quality of the sperm, the number of strands in the wick, the water level of the testing-meter, the temperature of the gas and the room, and the consequent corrections for thermometer and barometer, not to mention the influence of bias or prejudice in the manipulator, or keenness or otherwise of the optic nerve on the part of the operator. All these and other matters tend to cast doubts on the operation, and the consumer always ends with a sort of a sigh, after witnessing the photometrical experiment: "I don't know, but my bill is larger this quarter than it was last."

Now, with this view, I submit the enclosed sketch of an automaton register of the illuminating power of gas by the specific gravity. As is well understood, the specific gravity, when atmospheric air, moisture, and carbonic acid are absent, is the surest test of illuminating power, and I would ask the question, will it do? and if not, why not?



The sketch will be understood at a glance. A globe of glass or metal, holding, say half or a whole cubic foot of gas, is suspended at one end of a very sensitive balance, the arm of the balance being a tube for the conveyance of gas, which enters at the fulcrum by an elastic tube, which has no interference with the action of the balance; or the gas may enter there by a water-seal if preferred.

The globe is suspended in the usual way at the end of the arm. The gas enters it from the elastic tube taken from the arm to the brass tube supporting the globe, and finds its way to the bottom; then passes up the tube to a jet consuming 2 feet per hour, behind which is a scale for showing the height of flame, as in a "Lowe's Jet Photometer."

At the other end of the balance is a counterpoise, with weights and ready means of adjustment when required. From the arm projects a holder, with pencil and delicate spring, recording the rise or fall of the globe on a paper disc, actuated by clockwork, similar to Alexander Wright and Co.'s pressure registers, but having the concentric rings marking candles instead of tenths of pressure, the difference between the specific gravity of each candle being sufficient to disturb the equilibrium of the balance.

This paper being renewed once in 24 hours, and the gas in the globe being changed three or four times every hour, there will thus be a constant registry of illuminating power, the gas having, previous to entering the arm of the balance, passed through small purifiers containing materials to absorb carbonic acid, moisture, and atmospheric air, which may be changed once a week. The instrument will be enclosed in a case, 4 feet 6 inches long by 2 feet 6 inches high, having glass doors.

JOHN SOMERVILLE.

22, *Westmoreland Street, Dublin, Nov.* 18, 1875.

GAS-EXHAUSTERS.

SIR,—Since you kindly inserted my letter in your issue of the 26th of October, I have each week waited most anxiously for the post bringing your valuable JOURNAL, and have opened its pages in the hope that some of the more able of your correspondents would either approve of, or condemn, my views relating to gas exhaustion, in so far as I have as yet dared to lay them before your readers. I fully expected that, at least, my friend "M" would have given us his opinions on the views I had expressed, since he questioned the correctness of my statement in my opening remarks to the West of Scotland Association, at their Stirling meeting. Hitherto I have been disappointed in this; but shall continue to live in hope.

I am much indebted to Mr. George Anderson for the kindly notice he takes of the *strange conclusions* I have come to, and for the endeavour he makes to explain their error. I am only sorry to be compelled to say of his explanations what he said of my statements—viz., that there is a *show* of truth in them; and I am sure that if Mr. Anderson will give my letter a more careful perusal, he will see my reason for saying so. I am led to infer this from the fact that, in the first place, he misquotes my statements, and gives them an implied meaning which I never intended them to bear; and in the second place, that he instructs me of the fact that the working pressure is always to be overcome, whether the pressure of the atmosphere is high or low—a fact which, both at the commencement of my letter, and also at the West of Scotland meeting, I admitted. But what I *did* state, and what I *did* mean, was, that, from the nature of our apparatus, exhausters could be employed to do no more than simply relieve this working pressure, and that we were therefore compelled to regulate the pressure under which we distilled our coal by that of the atmosphere, and seeing that the atmospheric pressure was from day to day undergoing change, our coal must be undergoing distillation under varying pressures; and for a similar reason, as the atmospheric pressure is lessened, proportionate to the altitude above sea level, gas-works located at a considerable elevation will be distilling their coal under a less pressure than those located at the sea level. And further, seeing that the variations of pressure due to the position of a gas-work and to the atmospheric changes are as great as, if not greater than, we dare produce with our exhausters, I doubted the advantages popularly claimed for the artificial reduction of the pressure on the coal being carbonized; or, in other words, the utility of exhausters.

Mr. Anderson, in his *attempted* explanation, both admits and denies my statement. In the first place, he admits that the higher a work is located the greater will be the volume of the gas extracted from a ton of coal, because the particles of the gas are farther apart, in consequence of the surrounding air being rarer, and pressing upon them to a lesser degree; and yet he denies, or at least doubts, the influence of atmospheric pressure as affecting the pressure inside the retort, and invites me to try the experiment on the top of some of our Scottish hills, only asking me to bring down the gas to lower earth, to have it measured in accordance with the established laws of chemists. So far as the established laws of chemists are concerned, I would recommend Mr. Anderson to study Boyle's laws relating to the volume of gases under varying pressures. In all my statements, I took it as inferred that, when I spoke of the volume of a gas, it was as corrected for temperature and pressure to the British standard of 30 inches of mercury and 60° Fahr.

Perhaps Mr. Anderson and your readers would better understand my mode of reasoning myself into what he (Mr. A.) calls stange conclusions by the following illustrations:—

Suppose an ordinary steam-boiler generating steam and a gas-retort producing gas to be connected to one pipe, delivering the mixed gas and steam direct into the air, and that the barometer at the instant registers 29 inches of mercury, it is evident that both the retort and the steam-boiler will be generating gas and steam under similar pressures, and that the temperature of the water inside the boiler would be, roughly speaking, 210° Fahr., that being the temperature at which water boils, or, in other words, the tension of its vapour equals a column of mercury 29 inches high. Now, suppose that, instead of allowing the mixed gas and steam to escape into the air, we apply a safety-valve to the opening of the escape-pipe, which gives a pressure equal to one inch of mercury. Before the mixed gas and steam can now escape, it is evident that the gas must continue to be produced inside the retort and steam inside the boiler, till the tension equals this extra pressure and lifts the valve. The retort would now be producing gas, and the steam-boiler producing steam, under a pressure equal to 30 inches of mercury, 29 inches being due to the atmospheric pressure, and one inch to the safety-valve. The water inside the boiler would now indicate 212° Fahr., that being the temperature at which water vapour acquires a tension equal to 30 inches of mercury.

Suppose, now, that the atmospheric or barometrical pressure should suddenly rise to 30 inches of mercury. Before the mixed gas and steam could now escape, their tension would require to be increased till it equalled 31 inches of mercury, 30 inches being due to atmospheric pressure and one inch to the safety-valve, and the water inside the boiler would now have a temperature of 213° Fahr.

Now, I wish you to imagine that the pressure due to the application of the safety-valve on the outlet-pipe represents the working pressure which gas has to overcome when generated in an ordinary gas-work, and that the lifting of this safety-valve represents the action of the exhausters. Suppose, then, that the safety-valve should be now lifted, or, in other words, suppose the working pressure removed, the pressure would be reduced by one inch of mercury, and the coal and water would be distilling under a pressure equal to 30 inches of mercury, and of course the water would have a temperature of 212° Fahr.; but this pressure is no lower than when the safety-valve or working pressure was applied, when the barometer stood at 29 inches, for we had then only a total of 30 inches of mercury, 29 inches being due to the atmosphere, and one inch to the applied safety-valve.

Suppose, again, that the barometer were to fall to 28 inches, and the safety-valve or working pressure were reapplied, then the coal and water would be undergoing distillation, under a pressure of only 29 inches of mercury, 28 inches being due to the atmosphere, and one inch to the valve. This pressure is equal only to the first pressure, when the gas and steam were allowed to escape direct into the air, or, in other words, when the working pressure was removed, as far as would be practicable, by exhausters.

I have adopted this arrangement of the connected steam-boiler and retort, because it was the best that suggested itself to me to illustrate my meaning. The simple distillation of the water gives direct indication of increase or decrease of temperature required to raise the vapour tension of water to that of the pressure applied. It further shows that the mechanical pressure applied has the same influence on distillation as that of the physical pressure produced by the atmosphere. The destructive distillation in the retort gives no such direct indication.

I think it is evident, from the above reasoning, that atmospheric pressure will materially affect the pressure under which we carbonize our coal; or, in fact, that however carefully we may relieve our retorts from the working pressure, as shown by our gauge, we are only regulating the pressure under which the coal is being distilled to that of the atmosphere at the instant, and no more.

If, then, such is the case, and if exhausters produce the results claimed, works situated at considerable elevations *should* be totally exempt from all the evils of carbon deposit and choked stand-pipes, and should also produce better gas and a greater absolute yield per ton. I will illustrate this by taking the works belonging to the two towns nearest me with the greatest difference in altitude—viz., Glasgow, at sea level, and Lanark (if I remember right), about 800 feet above it. The latter, consequently, will have a lower barometrical pressure, due to its elevation, equal to about 12 inches of water. Then supposing that in the Glasgow works they worked level gauge, and in Lanark that the back-pressure equalled 12 inches of water, both works would be carbonizing their coal under similar pressures; and as I know that the Lanark works do not use an exhauster, but, at the same time, never have a heavier back-pressure than from 6 inches to 8 inches, it follows that the Lankark works must be carbonizing their coal at a pressure less, by from 4 inches to 6 inches, than they dare to do at Glasgow with their perfect exhausting arrangement.

My own experience fully substantiates the foregoing reasoning, and the letters in your columns prove that other managers still have the inconvenience of choked stand-pipes and carbon deposits, notwithstanding the exhausters in use; and this although exhausters are popularly put forward as a panacea for all such ills.

When I am writing you, I would much like to have made a few remarks on the other letters which have lately been published in your columns, relating to gas exhausting and its effects, more particularly in reference to the causes producing the deposition of carbon, and from what part of the distillation this deposition is produced; but this letter has already reached such a length that I am almost afraid to trespass further on your valuable space. Only allow me to say that, in my opinion, as the more volatile portions of coal tar and the rich light-producing liquid and gaseous hydrocarbons present in coal gas are much less permanent, or, in other words, more easily decomposed than the heavier portion of condensable tars, the likelihood is that these light hydrocarbons contribute most to the production of the carbon deposit. Perhaps on a future occasion I shall be able to give you more definite proof of this.

WILLIAM DUNLOP.

Corporation Gas-Works, Hamilton, Nov. 25, 1875.

SIR,—Reading in your esteemed JOURNAL, No. 652, the two refutations of my derivation of exhauster, I ought not for a moment to hesitate candidly to admit it to be erroneous, but have, in fact, a reason, by an association of sound, which made me, *per saltum*, go from the one word to the other, which is of quite a different derivation, and it is, of course, also incumbent on me to confess that the deduction which I made from it falls to the ground.

This, however, after all, changes not at all the main point of my remarks, the action of the exhauster being twofold, both very important—first, that of pumping out or exhausting the gas from the retorts, and secondly, that of driving or propelling it through the mass of purifying materials into the gasometers. The term "Exhauster," as denoting the *first* action, and, in my opinion, the most important, has at least the same right of *retaining* its place as the term "Propeller," signifying the *second* action, has of *displacing* it.

If Mr. Patterson, however, by all means prefers that term, and his fancy is humoured by it, he is at liberty to do so.

Both significations have, at least, equal rights of existence in gas-making.

CONRAD VOSS.

Crakow, Galicia, Nov. 15, 1875.

STAMPS ON GAS CONSUMERS CONTRACTS OR AGREEMENTS.

SIR,—I had occasion to defend a case in which the question was raised by a firm of solicitors at Romford as to the requirement of a stamp on our contracts.

I sent the original document to Somerset House, and it was returned to me some time after with an official red stamp, with the words "*Adjudged not chargeable with any stamp.*" On the left hand corner of the same was a blue stamp with "*No.* 610" *in centre, and the words* "*adjudication, 2 April, 75.*" This information may be of use to some of my friends.

West Ham Gas-Works, Nov. 26, 1875. EDWARD H. THORMAN.

PURIFICATION OF GAS IN CLOSED VESSELS.

SIR,—In my reply to the discussion on my paper on the "Purification of Gas" (session of the British Association of Gas Managers for 1874) I made use of these words:

"I believe we are approaching an era (and it will depend very much on gas managers themselves whether it will be inaugurated more or less speedily) when all the gas will be purified without lime purifiers—when it will be done in closed vessels, and they will not have to take off the lids."

I spoke thus, because I had in my mind that the common ammoniacal liquor which the coal yields can, and does, when employed first in washers and then in scrubbers, remove a large quantity of both carbonic acid and sulphuretted hydrogen.

It does not remove the whole, because the quantity of carbonic acid to be dealt with is far in excess of the other ingredients, and the liquor gets fouled with this, and rendered inert long before the others are removed.

But if after the washer and scrubber you could again bring the gas into contact with ammoniacal liquor from which carbonic acid and sulphuretted hydrogen had been removed, you would again make it active, when it would be in a condition to continue the process of purification.

This view is corroborated by what Mr. Harris said some years ago, that when he used Laming's desulphurized liquor he would get pure gas for a time, but as he could not depend upon it, the system was abandoned.

Now, it is evident that if the gas was purified for a time, it would have been purified for all time, if the conditions had remained the same.

That they did not remain the same was, no doubt, because the apparatus was defective for that kind of duty.

Again, Mr. Livesey in his paper this year, told us that, by the use of liquor purified by Hills's process, he removed carbonic acid, so that he could not get a test by the Cooper tube. He also said: "Were it not for the necessity to reduce the sulphur compounds, the purification from CO_2 and SH could be almost entirely accomplished by means of the liquor, charging the ordinary purifiers with oxide; . . . but an alkaline sulphide being needed for the sulphur compounds, the use of oxide has been almost entirely discontinued, and the purifiers charged with lime."

Now the question that arises is, cannot the sulphide that is necessary for the reduction of the sulphur compounds be made by the alkali ammonia instead of by the alkali?

If it can, then within the coal itself, and with efficient apparatus, we have all the elements necessary to the production of pure gas, and it may be done in closed vessels. The purification of gas in closed vessels is not new. I mention this in case some "dog should bark."

When I was, first at the Central and subsequently at the Surrey, under Croll, the whole of the gas was purified in closed vessels. Two wet purifiers, charged with dilute chloride of manganese, which extracted both ammonia and sulphuretted hydrogen, and then three wet lime purifiers for carbonic acid and the remaining sulphur; and one reason why I am anxious to see the purification of gas again restricted to closed vessels is the exceedingly small quantity of labour that is required, and why I desire to see it restricted to fluid or wet purification *versus* dry is the exceeding economy and effectiveness and certainty of result secured when the gas has to pass through a liquid.

Liquids are so permeable that the gas finds it impossible to get round any corner without passing through them. Besides, liquids have the power of increasing or facilitating chemical action. If you were to put perfectly dry lime, or perfectly dry oxide, into the purifiers, you would find the chemical affinity very small; moisten them, however, and their behaviour is entirely changed.

Returning, then, from this digression, I will now proceed to point out the manner in which I think our gas may be purified solely by the ammoniacal liquor, the coal itself containing all the necessary elements of purification.

There are numerous gentlemen spread over the country who have, or can easily procure, means of making the experiments; and if some one or two will set about it, they may, by next meeting of the British Association of Gas Managers, be able to tell us what they have achieved.

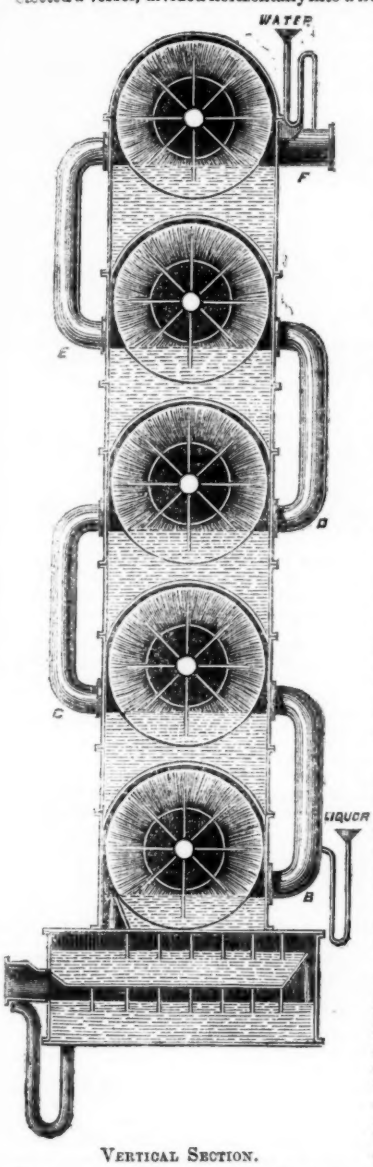
They may not have entirely succeeded, but doubtless they will have gone a long way, and by whatever height they may have climbed, they will find themselves nearer to the brow of that hill which they must reach before they can see the rays of that rising sun, whose beams will bring them peace and rest.

In thinking out this question, I have been constantly met by the opposition which I find many gentlemen have to employing washers, as their exhausters are unable to force the gas through them.

This is a defect of the exhauster, yet we must take things as we find them. I, therefore, began to consider how we could get an intimate contact of the gas with the purifying liquid without causing much increased pressure, and I think I have solved that.

Passing my stable, I saw the groom using a new whalebone fibre broom. I took it in my hand and examined it. There were strong elastic fibres about 4 inches long, pretty closely set. It occurred to me if one could constantly wet these and cause the gas to pass through between a long succession of these fibres, they would be sure to scrub the gas, if the liquid was of the proper kind, and from that idea I designed the machine shown in the margin.

It consists of a short length of my washer for a base, on top of which is erected a vessel, divided horizontally into a number of chambers, into each of which there is a circular drum, whose periphery is one continuous brush. The upper side of each of those partitions forms the bottom of a shallow tank of water, into which the brush drum above it dips.



Vertical Section.

The under side of each of those partitions forms the gas-way, in which the brushes revolve.

This machine is intended to act as an ordinary washer and scrubber, or as a purifier from either carbonic acid or sulphur compounds.

When acting as an ordinary washer and scrubber, pure water to the extent of 10 to 12 gallons of water to each ton of coal (Newcastle) used, would be run in at the top. This will pass down the pipes on the sides up which the gas travels, passing through each chamber in succession until it arrives at the washer, through which it will pass with the addition of the ordinary liquor of the works, which will be run into it towards the bottom as shown; and the entire liquor thus treated will run out at the seal-pipe at the opposite or left-hand side of the section, as shown.

The course which the gas takes will be, first, through the short portion of washer, which may be made to give from 2 to 3 inches of pressure, or any greater amount, the chief object of its use being to arrest tar from getting up among the brushes, where only clear liquid is wanted.

On issuing from the top of the washer, the gas will pass round the upper portion of the lowest brush from left to right, up the side pipe, *b*, round the second brush, from right to left, and out at *c*, and so on throughout the whole of whatever number of brushes it may have to pass through.

The brushes might be considerably increased in number, and, consequently, the height of the machine; but it should be observed that the distance which the gas has to travel, in passing round the brushes, is considerably more than the vertical height of the machine; besides, it may be found advisable, instead of having flat pipes for the upper passage of the gas and the downward passage of the water, to have them of boxes the whole length of the machine, and charged with some material to present a wetted surface, as in an ordinary scrubber, which, if satisfactorily applied, would further add to the distance the gas would have to travel through a purifying medium, without increasing, to an inconvenient height, the altitude to which the purifying liquid must be raised to enter at the top.

I propose that the brush-drums shall slowly revolve in an opposite direction to the gas, and, as this is alternately right and left, a band passed zig-zag round pulleys on the exterior of the shaft that carries the brushes will move the whole in the direction necessary.

All this has been gone carefully into, but to represent it would require more drawings than are necessary for the practical readers of the Journal of Gas Lighting. What is aimed at is that the gas shall pass through the coarse fibres of a revolving brush, which shall constantly lick up the liquid in which the lower part of it is immersed, and present it to the foul gas.

Whether I am correct in the chemical views which I hold as to being able to purify the whole of the gas by the products of the coal, I do not consider yet proved; but that the annexed figure will perform the functions now delegated to washers, I have not the least doubt. One part I have thoroughly tried; the other—the brush part—is now in action at one place, and will be in another before long; but I do not intend now to imitate the little boys who halloo before they are safely out of the wood.

Upon your insertion of the foregoing, I will send the *modus operandi* of using those vessels for the entire purification of gas, leaving for the present purifiers the duty of collecting the sulphur for sale to the manufacturers of sulphuric acid.

George Anderson.

Nov. 25, 1875.

STATION-METERS WITHOUT CASES.

Sir,—When I wrote my letter of the 4th inst., I intended that it should be the last with which I would trouble you on the subject; but I cannot refrain from offering a few remarks in reply to the two letters which have since appeared. I must confess surprise at the amount of correspondence elicited by the simple fact of a statement having been made by me, that I had constructed a meter to work without a case, which would perform the work required in a superior manner to one constructed as suggested by Mr. Micawber, and experimented with by Mr. Hartley, and it must be borne in mind that I have not once said that such a meter would prove of any practical utility, because I am perfectly aware that it would not.

In Mr. Hartley's letter of the 28th of September, it is stated that a meter constructed as suggested by Mr. Micawber would be perfectly useless, owing to the variations of the water-line, consequent upon the variations of pressure. Very good. But I did not consider that, in endeavouring to make a meter without a case, I was bound to adhere to Mr. Micawber's plan, so I dispensed with the "rectangular vat," and, by introducing the hollow shaft, obtained an instrument which the variations of pressure would not affect. I was not at the time aware that the hollow shaft was the invention of Samuel Clegg. I did not for a moment suppose that the meter, as made by myself, would supersede those now in use (and I am sorry if the bare possibility of such an event has caused uneasiness to any one), but I thought some one might possibly improve upon it, so as to make it applicable to station-meters of moderate size.

J. T.

Nov. 27, 1875.

Sir,—When I ventured to write you two months ago concerning my proposal to improvise a station-meter for a gas-work, to be worked without the usual case enclosure, and to request, through your pages, that some of the younger members of the gas fraternity would favour me therein with their views on the subject, I was certainly not prepared for so many pens, of both young and old, being set to work in the solution of my supposed difficulty. It is scarcely necessary to say that, having read all the contributions, I have found among them very satisfactory solutions to the problem, and I cannot do less than beg your permission thus to tender my acknowledgments and thanks.

It would seem, however, from the views expressed by some of the writers, that a very wrong and imperfect apprehension has been entertained by them as to the water level outside and inside the drum, and the stability thereof, as far as possible, as a necessary and essential condition of the instrument as a measurer of gas. To many, the recent discussion may be useful, not, perhaps, in the way of bringing out any new facts, but as correcting some popular errors on a subject in which all gas managers should be considered well read up.

In my estimation, nothing could better illustrate, and more fully dispose of, the fallacy contained in my first communication than the able and lucid letters of Mr. Hartley, with whom permit me to reciprocate his kind wish for a little more intimate personal acquaintance, the first time he finds himself so far north.

Le buideachas do Mghr *Hartley*, agus Mile teang duit fhein air son do choinneas,
'S mise go dillas agus go bragh

Glenmutchkin Gas-Works, A. Micawber, Jun.

Nov. 25, 1875.

[Our correspondent is good enough to furnish us with an interpretation of the closing sentence of his letter, which, for the benefit of those of our readers who have not been "so far north" as he, we append: "With thanks to Mr. Hartley, and a thousand thanks to yourself for your courtesy, I am, ever faithfully, yours."—Ed. J. G. L.]

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, Nov. 25.

(*Before Vice-Chancellor Sir* Charles Hall.)

THE ATTORNEY-GENERAL *v.* THE MAYOR AND CORPORATION OF DARLINGTON.

This was a suit instituted by information and bill, at the relation of Mr. Anthony Strong, a gentleman residing at Tees View Villa, close to the river Skerne, at the point where it flows into the river Tees, against the Corporation of Darlington, in which suit the Vice-Chancellor, on the 23rd of March last, granted an injunction, to restrain the Corporation, until the hearing of the cause, from discharging, or permitting to be discharged, into the river any sewage, filth, or other offensive matter, by means of the borough outlet or the sewer in the bill mentioned, and from otherwise fouling the river Skerne, so that stenches might be emitted therefrom, or any nuisance be created thereby to the damage or annoyance of persons living on the banks of the Skerne. This injunction was afterwards, on the 29th of July, ordered not to be enforced until the 10th of November inst., and a motion was now made on behalf of the defendants, with the view of obtaining further time for their works, that the injunction might not be enforced until the 1st of June next.

Mr. Dickinson, Q.C., and Mr. Humphry, in support of the motion, urged that the Corporation had been occupied in inquiries as to the best means of altering their system of drainage, and that further time was needed to enable them to carry out the necessary works, and to acquire lands for the purpose. They had been in negotiation for the purchase, by agreement, of lands belonging to the trustees of Lady Byron and to Lord Wentworth, for the purpose of disposing of the sewage of the borough by irrigation, but such negotiations had fallen through, and they were about to serve notices for the compulsory purchase of 90 acres of such lands.

Mr. Cookson, Q.C., and Mr. Crossley, for the informant, contended that the defendants had had ample time, and had done nothing whatever to mitigate the nuisance in respect of which the injunction had been granted, and they read evidence to show that sewage was still being discharged into the river Skerne, and that the foul stenches and noxious vapours and gases caused

thereby were injurious to health, and had, in fact, caused an outbreak of enteric or typhoid fever in the neighbourhood.

The VICE-CHANCELLOR said it appeared to him that the Corporation of Darlington had, in respect of the matters complained of in the information, been extremely dilatory, and that, in fact, nothing could be worse than the way in which they had proceeded. His lordship did not find, upon the evidence, that due diligence on their part which the plaintiff had a right to expect from a public body, and the defendants were extremely culpable for omitting to take the proper course. At the same time, his lordship did not think he should be doing the plaintiff any good by refusing to give the defendants a further extension of three months time. To that extent—*i.e.*, up to the 1st of March next—he should accede to the application, and he was satisfied that the time he thus gave was sufficient. If an application for further time were made to him, he should not consider it a sufficient excuse for further delay on the part of the defendants, that they had been unable to get the additional land which they said they required; for the proper course for the Corporation to take under the circumstances was to put themselves in the position of having authority to take the land, if necessary, by the compulsory exercise of parliamentary powers. The defendants must pay the costs of this application.

WARRINGTON POLICE COURT.—FRIDAY, NOV. 26.
(*Before the* MAYOR *and other Magistrates.*)

BREACH OF CONTRACT OF SERVICE BY GAS STOKERS.

G. Fairhurst and *J. Robinson*, stokers in the employ of the Warrington Gas Company, were summoned for a breach of contract of service.

It was proved that the defendants had agreed to work for the company, and that a notice of 14 days was requisite on either side before the contract could be annulled. The defendants left their work without notice, and as a consequence 70,000 cubic feet of gas were lost, equal in value to £12.

The defendants did not appear.

The CLERK said the bench had only power to award £5 damages.

The bench awarded that amount in each case, with costs. Fourteen days were allowed for the payment of the money, and two months imprisonment in default of payment.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board on Friday last—Sir J. HOGG, M.P., in the chair,

A letter from the Board of Trade, signed H. G. Calcraft, secretary, was read, transmitting a copy of a scheme for the amalgamation of the Imperial and Independent Gas Companies with The Gaslight and Coke Company, and asking to be furnished with any observations which the Board may have to make on the subject.

Mr. NEWTON thereupon moved—"That, in view of the proposed amalgamation of the Chartered, Imperial, and Independent Gas Companies, as resolved upon at meetings of the shareholders of the Chartered and Imperial Companies respectively, it be referred to the Parliamentary Committee to consider the proposed amalgamation, and, if necessary, to confer with the Board of Trade on the subject." In doing so he said: I do not intend to make any statement, on the present occasion, with regard to the proposed amalgamation of the gas companies, further than to say that it is a very important question, affecting very large interests. I think I am right in stating that, if these companies amalgamate, they will represent at least three-fifths of the whole gas supply of the metropolis, and a capital of between £7,000,000 and £8,000,000 sterling. It is, therefore, a question of very large importance, and one which this Board, being constituted the local authority on the question of gas, should look very closely and carefully into. It is an amalgamation of three companies—the Chartered, which is under a special Act of Parliament; the Imperial, which is also under a special Act; and the Independent, which is under the general Act, 1860. With regard to the Independent, there is no doubt that the consumers of that company are, at the present moment, favourably placed, as they are being furnished with gas at 3s. 4d. per 1000 cubic feet; whereas, the moment they become amalgamated with the Chartered Company, the price will be raised to 3s. 9d. For them, then, it is a very serious consideration, and, this Board being the natural representative of the consumers and the ratepayers of the metropolis, it is our duty to look closely into this question, and see that no undue advantage is taken of them. I dare say, if you have looked through the scheme which has been presented to the Board of Trade, you will agree with me that it is a very bald and meagre scheme, and one that does not at all convey to us the information that is necessary before we give our assent to the amalgamation of the companies. We are not told how the officers of the various companies are to be dealt with, although we are informed that they are to be pensioned at their full salaries, and we know that some of those salaries have been recently very largely increased in order that the scale of pensions may be greater. I think I am right in saying that not a word of that appears in the scheme, although it is a matter upon which we should require to be informed before our consent is given. It is likewise evident, from a further letter received from the Board of Trade, that they do not intend to sanction this amalgamation, nor to give any encouragement to it whatever, unless the companies interested agree to accept the principle of the sliding scale adopted in the Board's bill of last session. That, I think, shows the very successful efforts of the Board and the Corporation, in obtaining the establishment of a principle which has already received the sanction of a very important committee of the House of Commons, and I may say of the entire Legislature, inasmuch as that principle in its entirety was adopted in the Act of the Commercial Gas Company passed last session. I believe, from what has been stated, that there is a disposition to accept the sliding scale on the part of the companies; but then the question will arise as to what shall be the initial price of gas. The initial price acknowledged in the bill was 3s. 9d. For myself, I am prepared to say that if any alteration should be made in that initial price, it must be in its reduction, and that no increase of that price could be for a moment entertained by the Board; and further, that, so far as we have the power, we should be prepared to withdraw the bill altogether, rather than increase the price beyond 3s. 9d. I think circumstances have arisen, since the bill was before Parliament last year, which make the argument much stronger in favour of that price, or in favour of a reduction of that price, than existed when the bill was in committee. Therefore, in asking you to refer this scheme to a committee, I do it upon the full understanding that no alteration shall take place in the initial price, unless it be in the way of a reduction, and that under no circumstances will the Board assent to an increase to 4s., which is the price to which I believe the companies desire to have it raised. The Parliamentary Committee of this Board, I may state, are in perfect accord with the Gas Committee of the Corporation on this question. A deputation from that committee have met our committee, and it was distinctly understood that we should recommend to the Board and to the Corporation that the Regulations Bill of last session should be reintroduced precisely as it was settled by the committee of the House of Commons, in order that we may keep the Government up to their pledge, that the measure should be taken up exactly at the same stage to which it had reached when its further progress was arrested. Our notices in the public newspapers have been framed so that Parliament will be unfettered in dealing with the question when it comes before them. We shall endeavour, if possible, to get better terms for the consumers, and if not, we shall be prepared to support the bill as it stands before the House of Commons. I should myself very much like to see the initial price reduced to 3s. 6d., and I do not know whether that cannot be done with safety to the shareholders in the companies, and certainly with great advantage to the consumers. However, as we stand at the present time, all I have to say is that there will not be the slightest encouragement on our part to any increase in the initial price of gas above 3s. 9d. I move, therefore, this reference, and I hope that the committee will be prepared, at a very early date, to report to the Board. I think it very desirable that the committee, before they proceed to take any step in the matter, even to communicate with the Board of Trade, should make a full report to this Board. I almost doubt whether they will be able to do so next Friday, but if not, I trust they will on the following Friday, because the Board of Trade have given us a very short time for the consideration of the question. They require an answer from us upon the general scheme before long, and they have sent us another letter, in which they intimate their views on the subject. I quite approve of those views, because they are based upon a recognition of the principle, emphatically endorsed by the committee of the House of Commons last session, contained in the bill promoted by this Board, and they intimate that they will not consent to this amalgamation unless the principles of that bill are recognized in the scheme. This I regard as, to a great extent, a compliment to the Board and to the Corporation for their great exertions in respect to this question.

Mr. DRESSER ROGERS seconded the motion, which was put and carried.

The CLERK read another letter from the Board of Trade, addressed to this Board, as follows:—

Board of Trade, Whitehall, S.W., Nov. 24, 1875.

Sir,—With reference to the proposed scheme of amalgamation of the Imperial and Independent Gaslight and Coke Companies with The Gaslight and Coke Company, a copy of which was forwarded to you on the 22nd inst., I am directed by the Board of Trade to make the following observations.

Adverting to the proceedings before the select committee of the House of Commons upon the metropolitan gas companies bills of last session, it appears to the Board of Trade that they would not be justified in approving the amalgamation without being satisfied that proper steps are at the same time taken for the protection of the consumer. The principle of adopting a sliding scale of dividends inversely to the price of gas is one which was adopted by the committee, and inserted in the Act obtained by the Commercial Gas Company.

It further appears to be essential that any further capital should be raised by borrowing at the lowest rate at which money can be procured, rather than by shares bearing a high dividend. Supposing these two principles to be adopted by the amalgamating companies, and the question of the initial price of the gas and the reserve-fund were placed upon a satisfactory footing, it seems to the Board of Trade that the proposed scheme might be for the benefit of the consumers as well as of the gas companies.

As the scheme comprises some two-thirds of the metropolis, it may possibly thus afford, without the expense of another parliamentary contest (which, it must be remembered, falls upon the ratepayers), the means of settling this difficult and much-vexed question.

But before communicating with the gas companies on the above points, the Board of Trade are desirous of having the opinion of the Metropolitan Board of Works.

Should any such terms, as those above indicated, be adopted, it will be necessary to obtain the sanction of Parliament, and for this purpose notice must be given at once. The Board of Trade, therefore, request the views of the Metropolitan Board of Works may be communicated to them with the least possible delay.

I am, sir, your obedient servant,

J. E. Wakefield, Esq. T. H. FARRER.

Mr. NEWTON: I move—"That this letter be printed, circulated among the members of the Board, and referred to the Parliamentary Committee."

Mr. FOWLER seconded the motion, which was put and carried.

Mr. RICHARDSON moved—"That it be an instruction to the Parliamentary Committee not to agree to an increase in the initial price of gas approved of by the Select Committee of the House of Commons in the Regulations Bill of last session."

Mr. NEWTON seconded the motion, which was put and carried.

METROPOLIS WATER SUPPLY.

Major Bolton reports that during the month of October the state of the water in the river Thames at Hampton, Moulsey, and Sunbury, where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, and East London Companies are situated, was good for the first ten days, but bad for the remainder of the month, when the river was in a state of flood, owing to the heavy rains. The highest flood state of the river at Hampton during the month was 5 feet 9 inches above the (6 feet) summer level, and the lowest was 4 inches below summer level. On the 26th of the month the water rose 2 inches higher than on any previously recorded occasion of flood. At Seething Wells, Kingston, where the intake of the Chelsea Company is situate, the state of the water in the river was very bad during the month. The highest state of the flood water at this place was 7 feet above, and the lowest was 2 inches above summer level, The highest temperature of the water during the month was 58°, and the lowest 44°, while the highest temperature of the air at the same place was 66°, and the lowest 38°. These observations were made daily at nine a.m. The rainfall during the month was 4·41 inches. Consequent upon the floods, the water companies drawing their supplies from the Thames had to take in very turbid and much discoloured water, which was extremely difficult to filter effectually. The Kent Company have given notice to the Metropolitan Board of Works that it is proposed to give constant supply on and after March 1 and June 1 next respectively to two districts in Woolwich, containing together about 800 houses. The East London Company have given notice of their intention to extend the system of constant supply to some 3400 more houses after March 1. The auxiliary works at Sunbury supplied only a small quantity of water from the reservoirs at Hanworth during the early part of the month. Notwithstanding the bad quality of the water at the Chelsea Company's intake during the past month, the company succeeded in delivering well-filtered water in their district. The greatest care and attention has been given to the filtration, and the three filter-beds constructed last year are now getting into good working order.

ILLUMINATING GAS FROM PEAT.—At a statutory meeting of the South of Scotland Peat Fuel Company, Limited, recently held at Dumfries, the chairman, in dilating upon the value of the peat manufactured by the company, said that it was found to be most suitable for kiln-drying, bakers purposes, and he would especially wish to direct the attention of the public to its use in the production of gas. He had used the peat for that purpose for two years in his own gas-works, and was perfectly satisfied with the results, both as to the economy and the production of an excellent gas. The illuminating power of the peat gas alone was small; but he found that in using a mixture of three-fourths gas coal and one-fourth peat fuel, the illuminating power of the gas was in no degree inferior to the gas from cannel coal alone. That appeared to be in consequence of the peat gas during the process of distillation with cannel coal having that power of taking up some of the volatile hydrocarbon given off by the coal, improving the illuminating power of the peat gas, and saving part, at least, of the volatile hydrocarbon which, without the peat, would have passed over into the tar barrel. He had made no direct experiment to prove that such was the case, but he could account for the good illuminating power of the mixed gases in no other way. The remark had often been made to him by friends staying in his house: "What excellent gas you have," and they had expressed their surprise when told that it was partly made from peat.

WEST BROMWICH GAS SUPPLY.

A Special Meeting of the West Bromwich Commissioners was held on Wednesday last, to consider the advisability of applying to Parliament for powers to purchase the portion of the Birmingham and Staffordshire gas undertaking within the district of the commissioners.

Mr. R. FARLEY (the chairman), who presided, moved that this board should, either separately, or in conjunction with other local authorities, promote a bill in the next or next succeeding session of Parliament, to empower them to purchase from the Birmingham Corporation that portion of the gas undertaking within the district of the commissioners, to erect gas-works and other things necessary for supplying the district with gas; and that the commissioners be authorized to apply the funds or rates in payment of the costs attending such application. He said the Mayor of Birmingham had been frank enough to tell the people of that borough that he proposed to take a certain portion of the profits from gas, in order to enable him to make those desirable and important improvements of the town which the corporation had undertaken. Of course the people of West Bromwich had no objection to the profits being so applied if the costs came solely out of the pockets of the Birmingham consumers; but as the West Bromwich ratepayers had their own burdens to bear, he thought it would be most unjust and unfair that the West Bromwich consumers should be called upon to pay any part towards the improvements of the town of Birmingham. He was strongly of opinion that they would be just doing the right thing by making the purchase, and he trusted his colleagues were of a similar opinion.

Mr. LEES seconded the motion.

Mr. J. A. KENRICK thought the subject was of such great importance that it would not be wrong for him to point out what he considered to be some of the objections to the scheme. When he heard that the Corporation of Birmingham were going to buy the gas-works, he told his friend, Mr. P. D. Bennett, that it was exceedingly desirable the town of West Bromwich should manufacture its own gas, and, as a matter of principle, he was still of the same opinion. But they had not only to deal with a question of sentiment, but with the profit or loss that might arise from the concern. The whole question turned upon the price at which they were going to buy the gas-works from the Corporation of Birmingham. It was very well known that during the parliamentary struggle before the committee, a proposition was made to that board, and to the other local boards, offering the works at a certain price. However, many members of the board thought the matter could not be settled off-hand, and that the fairest manner was to go to arbitration. They pursued that idea; and in the Gas Act of the Birmingham Corporation there was a clause referring the question of purchase to arbitration. But directly the mayor had possession of the gas-works he set to work and reorganized them, and, by his statement to the Town Council, he had economized to the extent of between £20,000 and £30,000 a year. The mayor had a goodwill, and could show the amount of profit which he was likely to obtain from supplying the district of West Bromwich, and he would have everything presented in such a way that he was certain the Corporation of Birmingham would be able to obtain the fullest value for what they had to sell. They must remember that, in all probability, the arbitrator would give a large, an outside price, because the mayor would be able to show that he would make a very considerable profit. The commissioners would have to give a large price, and they would saddle themselves with a very considerable sum in arbitration expenses. He suggested that the chairman put himself in communication with the Mayor of Birmingham, and see if some terms could not be arrived at for purchasing the works, without going to the expense of arbitration.

Dr. UNDERHILL explained that the cost of arbitration would be divided between the various local authorities co-operating in the purchase. They would be able to borrow the money required at 4 per cent. Gas-making, no doubt, had been a very profitable undertaking, whether carried on by private companies or by corporations, and in West Bromwich they were admirably situated for making gas, with railway and canal communication, and plenty of coal in the district, together with a good site for gas-works.

Mr. P. D. BENNETT also supported the motion. At the same time he agreed with Mr. Kenrick, that it was necessary to consider the question of cost, and be fully satisfied that they should make a profit by the manufacture before they made the purchase. He could show that the course they proposed to take would be advantageous. He had made a calculation to show that the interest upon the total amount required for the purchase of the goodwill and the mains, at 4½ per cent., would not exceed 8½d. per 1000 feet of gas consumed in the parish of West Bromwich, estimated at 110 million cubic feet per year. That would be a fixed charge upon the present consumption. He estimated the value of new works at £30,000 at the very outside, which, borrowed at the same price, would give £1350, or a charge barely of 3d. per 1000 feet. After deducting the value of the residuals, he put the total charge at 2s. 11½d. per 1000 cubic feet. They must bear in mind that the Corporation of Birmingham had a right to charge a maximum of 4s. per 1000 feet, and he felt sure that at some time or other they would avail themselves of the right afforded them by the Act. Taking the maximum price of 4s., then, would give them a profit of 1s. 0½d. upon each 1000 cubic feet of gas consumed. He concurred with Mr. Kenrick as to the advisability of avoiding arbitration, if possible, and if the Mayor could be approached without involving the cost of arbitration, he, for one, should hold up both hands.

Mr. E. CADDICK expressed himself strongly in favour of the resolution.

The resolution was then adopted with one dissentient.

A public meeting of the ratepayers of the district was held the same evening —Mr. FARLEY again presiding—to consider the desirability of authorizing the commissioners to apply to Parliament for power to purchase that part of the Birmingham gas undertaking within the limits of the township. There was a large attendance, nearly all the commissioners being present.

The CHAIRMAN, alluding to the opposition to the Birmingham Gas Bill, reminded the ratepayers that the local authorities originally desired the time in which they had the option to purchase the distributing apparatus extended to 10 years; but he thought the time fixed by the Act was best after all, because in 10 years the consumers in the outlying districts might be lulled into a sense of false security, and allow the opportunity to purchase their portion of the gas undertaking to pass away for ever. On the 1st of January next the transfer of the gas undertaking to the Birmingham Corporation would be completed, and the consumers of gas in West Bromwich would be under their control. The Birmingham Gas Act provided that the corporation should repay the purchase money by instalments in 85 years. The annuities to be paid to the shareholders of the gas company, capitalized at 25 years purchase, amounted to £1,457,250; and as West Bromwich consumed one-fifteenth of the total quantity of gas sold, it followed that West Bromwich would have to pay about £97,150 towards the purchase-money, without any portion of the property belonging to them. The corporation were also empowered to raise a reserve-fund of £100,000, which also would belong exclusively to Birmingham. The corporation proposed to make important street improvements, and while the people of West Bromwich were glad to see those improvements carried out, and rejoiced in the prosperity and greatness of Birmingham as the metropolis of the Midland counties, they held that the cost of those street improvements should be defrayed by the people of Birmingham, and that the ratepayers of West Bromwich should not be called upon to assist in bearing the burdens of Birmingham. It was unreasonable for the ratepayers of West Bromwich to be indirectly taxed for those street improvements. If the outlying districts remained passive, in course of time Birmingham would become one of the richest, if not the richest corporation of England. With regard to the cost of the distributing apparatus, the Mayor of Birmingham had estimated it at four-fifths of the price paid by the corporation; whilst Mr. Jones, an eminent gas engineer employed by the corporation, had, in his evidence before the committee of the House of Commons, estimated it at one-third. Taking the latter estimate, which would give a sum of £32,383, to be paid by West Bromwich, and adding the cost of erecting the gas-works, parliamentary and arbitration costs £42,500, this would give a total of £75,000. He added to this a sum of £25,000 for working capital, making a total of £100,000. They hoped to redeem this sum in 100 years at an annual charge of principal and interest of £5000 per annum, and the gas undertaking would then be absolutely free. The gas consumed in West Bromwich amounted to 110 million cubic feet per annum, which would be increased to 120 million by the time they were in a position to commence the manufacture. The interest of redemption money represented 10d. per 1000 feet. For the cost of manufacture, inclusive of coal and all incidental expenses, after deducting value of residual products, would be 1s. 8d. per 1000 feet, making a total cost of 2s. 6d. per 1000 feet, and adding 6d. for profit, they had a maximum charge of 3s. per 1000 feet. He concluded by moving a resolution for applying to Parliament for purchasing powers, and for empowering the commissioners to manufacture gas.

Mr. COWSE seconded the motion, and advised the ratepayers not to allow themselves to be in a position to be dictated to by the Birmingham Corporation.

Mr. T. B. LEES pointed out that the chairman had estimated his cost of the purchase of the mains on the most favourable basis, but if a higher sum were awarded it would increase the cost of the gas. He wished to know if the chairman had any reliable data as to the cost of gas being 1s. 8d. per 1000 feet.

The CHAIRMAN replied that he had been told that gas could be manufactured at 1s. per 1000 feet, which is a very low estimate indeed. The Walsall Commissioners, he believed, were supplying gas to their consumers at 1s. 10d. to 2s. 3d. per 1000 feet; and the Birmingham and Staffordshire Company, in view of that competition, had been supplying the consumers at Walsall at something like 9d. per 1000 feet less than to the consumers at West Bromwich.

Mr. FILLMORE pointed out that there was a discrepancy of 6d. per 1000 feet in the cost of manufacture between the statements of the chairman and Mr. P. D. Bennett at the last meeting of the commissioners.

A RATEPAYER said he understood that the Mayor of Birmingham had intimated that he was going to claim £74,000 for the West Bromwich portion of the undertaking, and if it was usual for the arbitrator to split the difference, then the amount would be much larger than that given by the chairman. He reminded them that the corporation could not charge the consumers of gas in West Bromwich any more than the consumers in Birmingham, and therefore the Birmingham consumers would take care the cost was not increased, for their own sake.

Mr. P. D. BENNETT supported the resolution, and contended that as a business speculation the manufacture of gas by the representatives of the ratepayers had every probability of being a great success. If any advantage was to be obtained from the manufacture of gas, he thought the ratepayers of West Bromwich should participate in it. He entered into statistics to show that the mains could be purchased, and every provision made for the manufacture of gas, at 2s. 11½d. per 1000 feet. He had made plenty of allowance for every charge, but he thought the chairman's calculation of 2s. 6d. was almost too favourable. He enumerated many advantages that would result from the manufacture of gas in their own district, and pledged his reputation that the district would derive a benefit from the scheme.

Mr. FILLMORE wished to propose an adjournment of the meeting, to give the ratepayers an opportunity for considering the views advanced; at the same time, he did not wish to offer any opposition to the course proposed by the commissioners.

Mr. BAYLEY, clerk to the commissioners, having ruled that it was contrary to the Act of Parliament to allow any amendment to be taken, and that the meeting must vote on the resolution *pro* or *con.*, it was put, and adopted *nem. con.*

TIPTON GAS SUPPLY.—On Wednesday last, a public meeting was held at the offices of the Tipton Board of Health, Church Lane, Tipton, to consider the advisability of empowering the local board to promote a bill in the coming Parliament, whereby the board could purchase from the Birmingham Corporation that portion of the mains and works of the Birmingham and Staffordshire Gas Company which supplied Tipton. Mr. James Whitehouse presided, and moved that power should be given to the board. Mr. Thomas Jones seconded the resolution. He thought Tipton was a likely place to realize a profit, which could be used to lessen the rates and make improvements. Mr. Watson said he was in doubt as to the profits. All they had to depend on was figures, and those could be made to prove anything. Should the board realize all they appeared to expect, it would be a good thing if the parish purchased the works. He hoped that if the mains and works were purchased, a uniform rate per 1000 would be charged. Mr. Peacock said at the proper time he should oppose such a suggestion. Mr. William Whitehouse supported the motion, on the ground that Tipton should not be trammelled by the Birmingham Corporation. No doubt the latter would go in for the maximum prices, and make a handsome profit. The motion was carried unanimously.

WALSALL COMMISSIONERS GAS SUPPLY.—A special meeting of the commissioners was held on the 23rd inst.—the Mayor (Mr. T. Checkley) in the chair. The quarterly and other accounts were ordered to be paid, as follows:—On gas-works revenue account, £1520 3s. 9d.; on capital account, £128 16s. 4d.; on account of Rushall district, £22 14s.; on general account, £136 9s. 5d. On the recommendation of the Gas Committee, it was moved by the Mayor, and seconded by Mr. Brownhill, that gas-mains should be extended to certain new houses and other premises, at a total cost of £77 1s. 6d. Mr. Abbey asked if any estimate had been made of the amount of gas which would be consumed by these premises. He also asked if it was not an opportune time for considering whether a meter-rent should be charged, or whether the meter should not be paid for. The Birmingham Company would soon cease to exist, and there was apparently a good opportunity to make a charge, and so stop some of the very frivolous complaints which were made about the meters. The motion was carried unanimously. As to the gas accounts, the amounts received from private consumers had been £1746 7s. 2d., being an increase of sales to the amount of £159 12s. 10d. on the corresponding quarter of last year. The total receipts for the twelve months had been £13,452 10s. 11d., which exceeded the previous year by £893 13s. 3d. The total profit, previous to setting aside any sum for depreciation, was £2401 19s. 9d., as compared with £889 18s. 4d. in the year 1874. The profit and loss account to Sept. 30 showed a net profit, after providing the usual reserve, amounting to £921 12s. 10d. Out of this, £553 12s. 10d. had been set aside to bring up the amount available for depreciation last year to the usual amount, leaving a balance of £368. The additions on the capital account had been of the value of £506 12s., from which sum there was to be deducted £250 16s. received from the sanitary authorities for new lamps, and the difference added to the gas-works capital account. The total of this had now reached £50,261 9s. 6d., and the loans remained unaltered at £11,050. Mr. Brownhill said this report showed that they had been making gas of 15-candles illuminating power, paying interest, and providing for depreciation. At a gross cost of about 1s. 10d. per 1000 they provided the gas, and this left 5½d. of the average price, which was sufficient to pay the interest on capital and a reasonable sum for depreciation.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of Shareholders was held at the City Terminus Hotel, Cannon Street, London, on Thursday, Nov. 25—JAMES SYDNEY STOPFORD, Esq., in the chair.

The SECRETARY (Mr. A. Hersee) read the advertisement convening the meeting, and the following report and statements of account were presented:—

In presenting to the shareholders a statement of accounts for the twelve months ending the 30th of June last, the directors have the satisfaction to report that the operations of the company continue to make favourable progress.

The increase of public lighting at Calcutta during the year was limited to seven lamps in the approaches to the Hooghly and Ha-tings Bridges, but an order for the erection of 26 new lamps in the recently formed Grey Street was subsequently received, and these were lighted with gas on the 1st of October; it is hoped that orders for lights in the side streets branching from Grey Street will shortly be given. At Howrah, four public lamps were added during the year, and, through the negotiations referred to in the last annual report, 75 extra street lamps have since been erected, of which 24 were brought into revenue on the 1st of July last, and the remainder on the 1st of October.

The consumption of gas for private lighting has made very satisfactory progress. The additional burners fitted amounted to 3079 in Calcutta and 163 in Howrah, and 57 new consumers were obtained. Among the buildings to which gas has been recently applied are the Imperial Museum, St. Saviour's Church, the Hooghly Bridge and the Howrah Mechanics Institute; additional lights have also been fixed at the clubs and railway station. The total number of lights on the 30th of June last (including Howrah) were—public, 3502; private, 37,301; compared with—public, 3491; private, 34,059, on June 30, 1874. The average quality of the gas has been maintained well above the required standard, and, judging from the absence of complaints, the supply is satisfactory to the consumers.

The shareholders are aware that H.R.H. the Prince of Wales has arranged to visit Calcutta in December next, and will remain in the capital a few days. During his stay there will be general festivities, and his arrival will be marked by a grand illumination of the city.

The efficiency of the works and machinery at Calcutta and Howrah has been carefully maintained. The new station-meter is at work, and affords complete satisfaction. The new purifiers and condenser are erected in readiness for the approaching busy season. A new station governor has also been added. The increasing demand for gas at Calcutta renders it necessary to provide an additional gasholder at an early date, and the question is now under the consideration of the directors.

The effect of the water and drainage operations of the Municipality upon the mains of this company was felt very severely during the past year, and strenuous efforts have been made by the manager and staff in replacing damaged pipes. Upwards of eight miles of mains were renewed, and (subsequently to the 30th of June last) a further length of 2½ miles, leaving only a comparatively small amount of replacement unexecuted. Your directors, while regretting the heavy outlay, are glad to report that the leakage has consequently been considerably reduced. New additional mains to the extent of 1140 yards were also laid during the year.

The shareholders will be gratified to learn that several new descriptions of native coal, suited to the manufacture of gas, have lately been attested at the Calcutta works with encouraging results. These additional sources of coal supply are of the highest value to the company, in ensuring a full supply at moderate price.

It is with much regret your directors have to announce the decease of their esteemed colleague, John Fisher, Esq., who devoted himself, at all times, to promote the welfare of the concern. In accordance with the rules and regulations of the company, the directors have provisionally appointed Henry M'Lauchlan Backler, Esq. (one of the original auditors), to fill the vacancy on the board, and his qualifications being so well known, they confidently recommend that his election be confirmed. The appointment of Mr. Backler to a seat at the board will necessitate the election of a new auditor; Edward Felix White, Esq., has given notice of his intention to offer himself as a candidate for the office.

The valuable assistance rendered by the members of the resident committee (Messrs. E. Broughton, R. C. Noble, and H. W. Wood), in attending to the interests of the company, is appreciated by the directors, who take this opportunity to recognize also the energy and zeal displayed by the engineer and manager, Mr. Blackburn, in the performance of his duties.

The general revenue account shows a balance of profit (after crediting £1374 0s. 4d. to the reserve-fund) of £13,672 11s. 1d., out of which your directors recommend a distribution of 5¼ per cent., free of income-tax, payable on the 4th prox., making, with the interim dividend of 4 per cent. on the 4th of June last, a total of 9¼ per cent. for the year.

The directors who retire on this occasion are—Walter Thomas Fawcett and Henry M'Lauchlan Backler, Esqrs.; the remaining auditor, Thomas Newton Stokes, Esq., also retires. All are eligible for re-election, and offer themselves accordingly.

Balance-Sheet, June 30, 1875.

Dr.				*Cr.*			
30,000 shares of £5 each.	£150,000	0	0	Amount of plant on the 30th of June, 1874	£267,705	19	0
30,000 ditto (50s. paid)	75,000	0	0	Outlay during the past 12 months	5,475	14	0
	£225,000	0	0	Cost of plant to the 30th of June, 1875	£273,181	13	0
Loans on debentures	74,320	0	0	Services laid and meters in use	6,533	16	6
Unclaimed dividends	456	2	7	Amount due to the company	7,103	18	4
Reserve-fund	8,854	7	0	Value of stocks, viz.—			
Amount due by the company	5,919	14	10	Coals	7,244	1	8
Balance from general revenue account	13,672	11	1	Purifying material	148	10	0
				Products	1,089	5	10
				Fittings and meters	6,809	16	7
				Pipes	5,674	17	0
				Horses, conveyances, &c.	458	15	0
				Sundry stores	6,453	10	9
				Office furniture, &c.	457	18	5
				Cash in London	4,086	13	11
				Bank bills in hand	3,974	18	6
	£328,222	15	6		£328,222	15	6

Profit and Loss, or Working Account, for the Twelve Months ending June 30, 1875.

Manufacture & distribution—Coals used, purification, and wages	£21,626	17	7	Gas-rental	£47,887	3	2
Salaries in India & London	2,711	0	6	Coke, tar, fittings, &c.	14,644	16	5
Directors and auditors	913	0	0		£62,531	19	7
Passage & general expenses	932	13	8	Transfer fees	12	12	6
Exchange	2,136	16	7				
Reserve-fund	1,374	0	4				
Mains account	3,912	8	11				
Wear and tear and repairs	2,740	8	11				
Retort account	519	10	2				
Bad debts and allowances	158	0	0				
	£37,024	16	6				
Balance	25,519	15	7				
	£62,544	12	1		£62,544	12	1

General Revenue Account, June 30, 1875.

Dividend of 5¼ per cent. balance of 9¼ per cent., for the 12 months ending the 30th of June, 1874, declared at the general meeting, November, 1874	£12,375	0	0	Balance on the 30th of June, 1874	£13,383	14	10
Interim dividend of 4 per cent., on account of year ending the 30th of June, 1875, paid June 4	9,000	0	0	Ditto on profit and loss account	25,519	15	7
Interest on debentures	3,662	7	4				
Income-tax	193	12	0				
	£25,230	19	4				
Balance	13,672	11	1				
	£38,903	10	5		£38,903	10	5

The CHAIRMAN having expressed his regret at the absence of Mr. Fawcett from his accustomed place, owing to an indisposition from which he is but just recovering, said he thought the shareholders would agree that the progress of the company during the last year had been very satisfactory. The revenue had increased on all heads 7 per cent., the Calcutta rental at the rate of 5 per cent., and the Howrah rental 15 per cent. over the years 1873-1874. The public lighting had also increased, but was still rather restricted, owing to the exhaustion of the sum raised by the rate for lighting purposes. As fresh improvements took place in Calcutta the rate would be increased, and the directors hoped that out of that they would receive a little more to extend the public lighting. New streets were being opened out, one of them—Gray Street—a mile in length and quite straight, a somewhat unusual thing in that city, the company had received orders to light, and they were now looking for orders to light the smaller streets running into it. At Howrah the state of things was very satisfactory. The company had received orders for the erection of 75 public lamps, part of which were already put up, and the remainder would be in their places during the present year. There had not been very much benefit derived from the increased public lighting this year, but there would be next. The bridge across the Hooghly had been a great success; it was now in full operation, and was lighted by the company on both sides. The completion of this work would, he believed, lead to a more extended lighting of Howrah, which was a far more agreeable locality for European residence in the hot season, having the gale across the river. The directors looked forward to Howrah doing the company a great service in their revenue. The private lighting had also increased very much. The company had not obtained many new customers during the year, but some of those which had been obtained were very large consumers. He had a list of eleven, whose average requirements were 200 lights each, which represented a considerable quantity of gas consumed. The bazaar lighting was not so satisfactory, and the directors had been obliged to drop it gradually. The quality of the gas generally was exceedingly good, and the company had no complaints. The next thing to notice was the approaching visit of the Prince of Wales, who was expected at Calcutta next month. The city had made great preparations to receive him with due honour, and he hoped the Calcutta lighting would prove as good as that at Bombay. Acting on the advice of Mr. Blackburn, the directors had sent out a great many lamps and devices of various kinds, but though the consumption of gas would probably be very large, the profit to be expected was not much, because the supply of gas under such circumstances involved a considerable amount of leakage and waste. The works generally were exceedingly efficient, and perfectly adequate, with the exception of the storeage. He was sorry to say that the gasholder had not proved sufficient for the increased make, and latterly had shown signs of weakness. The board, therefore, had decided upon sending out another, and had made the necessary arrangements for the purpose. They hoped to be able to send it out in March, and to have it erected for use before this time next year. It would involve a heavy outlay—from £8000 to £10,000, but it was advisable and necessary, as it would never do to go on with the one gasholder. He might take the opportunity of informing the shareholders that the directors had determined to make a small call of 10s. a share upon the second issue of 30,000 shares, and to make the call payable on the 1st of January next. The proceeds would be very useful in paying for the new gasholder, as well as that portion of the cost of new mains recently laid down, which was due to capital account. The purifying arrangements had been pretty complete; there were no complaints of sulphur, and scarcely any of ammonia. This was very satisfactory. The process of main-laying had been active. During last year about 8¼ miles of new mains were laid. The soil in Calcutta was very treacherous, and the company had continual complaints of subsidence, causing the old mains of small diameter to break. They remained perfectly good while not disturbed, but the Municipality had been digging under them for the purpose of putting down sewerage and water pipes, to the great injury of the company's property, for which they could obtain no compensation. The new cast-iron pipes, it was to be hoped, would prove more serviceable, and would last a long time. The manager had been very busy in replacing mains, and had only about three miles more to complete, which would be effected this year. When this was done, the directors hoped that the great sore of the company—the leakage—would be considerably reduced. It had already been much improved by what was done, as would be seen when he stated that, whereas in 1874 the leakage was 430,000 cubic feet per mile per annum, in the present year it was only at the rate of 260,000 feet. They hoped to get it lower still, but he was afraid it would never be so low as in European towns and cities. With reference to their coal supply, the directors were in great spirits about it. They had never had any difficulty with it, and now there were many new pits opening in the district, so that there was a sort of competition among the owners to get the company as customers. There was, therefore, no fear of a rise, and no fear of coal being exported or used in any quantities for other purposes. Their manager was always on the look-out for the best coals, and he had obtained a good return from those he had purchased. In that district also there was iron-stone and fire-clay, so that by-and-by, in all probability, the company would have their retorts, castings, and bricks made there, instead of having to send them from England. Referring to more personal matters, he had to express the great regret of the directors in having to report the death of Mr. Fisher, who was one of the largest shareholders, well versed in gas matters, a very useful director, and one who always took a deep interest in the concerns of the company. He (the chairman) believed that the shareholders would approve the choice made of Mr. Backler to succeed the late Mr. Fisher. Mr. Backler was well known in this company, having been one of the auditors from the commencement, nearly 20 years ago. He had had many years experience in gas matters, and the directors felt that they might congratulate themselves and the shareholders upon the acquisition thus made to the board. With respect to the dividend, it was the same as last year, and that was an increase upon the former year. The company had had a great deal of outlay this year; they had also carried a considerable sum to reserve; still they were able to pay 9¼ per cent. He was happy to add that the present year had opened very favourably, and the directors hoped to pay an increased dividend at the next meeting, although, in consequence of the call to which he had referred, there would be an increased capital to pay it upon. He concluded by moving the adoption of the report.

Mr. WHITE seconded the motion. He could confirm every word the chairman had stated as to the excellent position in which the company stood, and to the fact that their prospects were even more encouraging. He trusted that the enormous leakage, which the execution of the works of sewerage and water by the Municipality had entailed upon them, was now nearly over, and that the per centage in the future would be much lower than it had been. The company did commence an action against the Municipality to recover damages for the injury done to their property, and they had precedents in this country for the course which they adopted; but upon mature consideration, remembering that the corporation were the best customers of the company, it was thought prudent not to press those proceedings any further.

Mr. HAMMACK expressed his satisfaction at the progress made by the company, and congratulated the directors upon having maintained friendly relations with the Municipality of Calcutta. He hoped to see the company soon take its place as a 10 per cent. company.

The motion was put and carried unanimously.

The retiring directors, Mr. Fawcett and Mr. Backler, and the retiring auditor, Mr. Stokes, were re-elected, and a resolution was adopted, declaring the dividend recommended in the report.

On a motion to elect Mr. E. F. White to the vacant auditorship,

Mr. HAMMACK raised an objection that Mr. E. F. White, being the son of a director, was not qualified to occupy the post. An auditor, he maintained, should be wholly independent of the board, standing, as he did, in an intermediate position between them and the shareholders. Rather than allow the election to pass unchallenged, he would, as an original shareholder in the company, offer himself as a candidate.

General RIGBY said he thought there was much force in the objection, and therefore seconded the nomination of Mr. Hammack.

A SHAREHOLDER suggested that Mr. White should withdraw his name, after the remarks which had been made.

Mr. PEILL (a director) said he thought Mr. Hammack had better withdraw, seeing that on behalf of Mr. White the board held 3000 proxies, so that it would be useless to go through the form of an election.

Mr. HAMMACK doubted whether the directors could use proxies to secure the election of a son of a director to the auditorship, unless the shareholders giving their proxies had been informed of the question upon which they were to be used.

The SECRETARY said the proxies were sent in by Mr. White for the express purpose.

Mr. HAMMACK said he would challenge Mr. White to use them. He suggested to him that it would be better to withdraw his name.

Mr. E. F. WHITE said he was in the hands of his father.

Mr. WHITE refused to withdraw his son's name.

Upon a reference to the Articles of Association it was found that proxies were not available in the election of an auditor, the decision resting with the shareholders present at the meeting.

The amendment was therefore put, and carried by a considerable majority, and the chairman declared Mr. Hammack elected.

Mr. WHITE demanded a poll, but after some conversation agreed to withdraw the same.

A resolution, conveying a cordial vote of thanks to the directors and to the committee in Calcutta, was then put and carried.

The CHAIRMAN, in acknowledging the vote, took occasion to pay a high tribute to the energy and skill of the company's manager, Mr. Blackburn, and to propose a vote of thanks to him and to Mr. Hersee, the secretary, for whose services he remarked that the shareholders had good reason to be grateful.

Mr. STOKES seconded the motion, and said that having, as one of the auditors, to be in frequent communication with the secretary, and to see the accounts sent over to England by the manager, he could assure the meeting that these officers deserved the expression of their approval.

The motion having been accepted,

The SECRETARY acknowledged the vote for himself and for his colleague in Calcutta, to whose labours, especially in connexion with the works for reducing the leakage of gas, he referred, as of very great importance and value to the company.

The proceedings then terminated.

BOMBAY GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held at the Offices, Great Winchester Street Buildings, London, on Thursday, Nov. 25—DANIEL T. EVANS, Esq., in the chair.

The SECRETARY (Mr. Marshall) having read the notice convening the meeting, the following report and statements of account were presented:—

Your directors have pleasure in submitting to the shareholders a statement of accounts, duly audited, for the half year ending the 30th of June last.

The progress of the company continues satisfactory. There has been a steady increase in the rental from private consumers; but there has been a decrease in the revenue from coke and profit on fittings. Most of the other items remain about the same.

The contract with the Municipality of Bombay for the public lighting of the city would expire on Aug. 1, 1878. It was desirable for various reasons that a new and substituted contract should be entered into; and your directors have pleasure in informing the shareholders that, after long and anxious negotiations, they have settled a new contract with the Municipality, under which the public lighting of Bombay is secured to the company for 14 years from July 1, 1876, on terms which they believe to be fair and equitable, and which they hope will work beneficially for both parties. The contract was signed and sealed on the 13th of August last.

In the hope of increasing the consumption of gas by private consumers, your directors have instructed their manager to reduce the price; the reduction will take place simultaneously with the coming into operation of the new contract with the Municipality.

The accounts show a net profit for the half year of £11,090 7s. 2d.; and, after appropriating £2000 to the reserve-fund, your directors declare an interim dividend, free of income-tax, at the rate of 3½ per cent. for the half year, leaving a balance of £755 6s. 9d. to be carried to the credit of the current half year. They have written off from the reserve-fund, for depreciation and preliminary expenses, the sum of £2749 8s. 6d. The dividend will be payable on and after the 1st of December next.

General Balance-Sheet, June 30, 1875.

Dr.				*Cr.*		
Capital authorized— (50,000 shares, at £5 each—£250,000.)				Construction account	£199,544	18 10
40,000 shares, £5 paid	£200,000	0 0		Less written off preliminary expenses account	2,500	0 0
10,000 „ £4 paid	40,000	0 0			£197,044	18 10
Debentures	14,850	0 0		Goods *in transitu*	347	9 4
Amount owing by the company	1,360	2 2		Retort account	905	2 4
Reserve-fund £6,950 12 11				Stock in trade, viz.—		
Added this half year	2,000	0 0		Chandeliers, Brackets, &c.	6,228	18 5
	£8,950	12 11		Brass and iron goods, tubing, &c.	5,578	9 1
Written off for depreciation & from preliminary expenses account	2,749	8 6		Materials, mains, and services	1,532	9 10
	6,201	4 5		Meters	2,561	7 1
Insurance-fund	1,265	13 0		Coal	23,974	0 6
Passage-fund	313	17 11		Coke	306	0 0
Balance to general revenue account	9,155	6 9		Tar	85	8 2
				Tools and sundries	777	18 9
				Exchange equalization account	428	2 7
				Amount owing to the company	5,700	14 7
				Cash at bankers, on deposit, and in hand	19,175	4 9
				Bank bills in hand	8,500	0 0
	£273,146	4 3			£273,146	4 3

Profit and Loss Account, for the Half Year ending June 30, 1875.

Coal carbonized	£7,150	12 5		Gas and meter rental	£19,855	17 5
Wages	1,113	15 6		Coke	3,410	3 3
Purifying	21	11 6		Tar	735	0 5
Maintenance of retorts	301	12 10		Fittings	265	12 0
Trade and general charges	1,052	19 3		Interest	175	10 7
Salaries and collectors commission	1,859	7 8		Transfer fees	15	14 4
Rents, rates, and taxes	373	12 7				
Directors and auditors remuneration	676	5 0				
Bad debts and allowances	27	1 5				
Law expenses	40	12 8				
Exchange account	600	0 0				
Passage account	150	0 0				
Net profit	11,090	7 2				
	£24,457	18 0			£24,457	18 0

General Revenue Account, June 30, 1875.

Dividend for half year ending Dec. 31, 1874	£9,600	0 0		Balance, Dec. 31, 1874	£10,189	8 1
Interest on debentures	524	8 6		Net profit for half year ending June 30, 1875	11,090	7 2
Amount carried to reserve-fund	2,000	0 0			£21,279	15 3
Balance carried down	9,155	6 9		1875, July 1.—By Balance brought down	£9,155	6 9
	£21,279	15 3				

The CHAIRMAN: Gentlemen, the report and balance-sheet which have been circulated amongst you disclose so fully the exact position of the company, that I need not detain you beyond a very few minutes with remarks on this occasion. Indeed, it has not been my custom to review as minutely at these half-yearly meetings the accounts of the company, or to enter into particulars of its existing condition, as I do at the yearly meetings, and for this reason—that the working for a simple half year is not sufficient to show what is the actual progress and state of the company, compared with the working for the 12 months. Nevertheless, I may give you some particulars of interest, and some explanations of the accounts, and I shall have pleasure in entering upon them at once. If you refer to the accounts, you will see, upon the credit side of the general balance, that we have written off for preliminary expenses a sum of £2500, leaving still a balance of £4200. Our Articles of Association require that we shall write off a certain amount of preliminary expenses, from time to time, until they have all been liquidated. We have hitherto done that only to a small extent; but, all things considered, it was the opinion of the board that on this occasion we should write off £2500 out of the reserve-fund, as appears in the account. The next remark I have to make is that, as compared with the last half year, the cash at bankers and in hand shows a reduction in round numbers of £25,000. Last year it stood at £52,000; this year it stands at £27,000. The difference is represented by investments in coal, our stock amounting now to £24,000, as compared with £9000 this time last year. The remainder is made up of payments on account of debentures. I wish we could pay off the whole, but there still remain about £15,000, one-half of which will become payable next January twelve months. If you refer to the profit and loss, you will find that the gas and meter rental shows an increase of £762. In June, 1874, the amount was £19,093; in June, 1875, it was £18,855, showing a favourable result this year, which I am sure you will appreciate, as your directors do. Referring to the item of coke, there is a decrease of £1213. In June, 1874, the amount was £4623; this half year it is only £3410. As respects the coke sales, I may explain that in 1873 they stood at the highest figure they have ever attained with us. The reason for that is a simple one—the value of coke always bears a relation to the price of coal. The price of coal in that famine year was very high, and during that time we obtained exceptionally high prices for our coke. It may interest you if I refer to the coke sales for the last few years. In 1871 they amounted to £5109; in 1872, £6051; in 1873, £8551; in 1874, to £8631; and in the last half year to £3410. Contrasting the last half year with 1871-72, the two years before the coal famine, it will be found that there is an increase of £800. There was an increase last half year upon our tar of £69; but in the fittings there was a decrease of £650. This is due to the fact that our manager at Bombay, in the hope of extending the use of gas among private consumers, has been furnishing fittings at a small profit—in some instances at actual cost price. Undoubtedly the great event of the half year is that the company have negotiated successfully, and have entered into, a new and extended contract for the public lighting of Bombay—a contract commencing on July 1, 1876, and extending over 14 years. The old contract was for 7 years, from Aug. 1, 1871, and would have expired in 1878. It was for 2360 lamps, at £10 per lamp per annum, yielding a rental of £23,970, and involving annually a consumption of 38 million feet of gas. I need not enter into all the particulars of the new contract, which practically secures for us a monopoly of the supply of gas in Bombay; I will merely say that it is for 14 years from the 1st of July next, and will consequently expire in 1890, and it is for 820 additional lamps, making a total of 3170 lamps, at 80 rupees per lamp—about £8 per annum. It will yield us a rental of £25,360, and the consumption of gas under it will be 51 million feet a year. I should explain to you that under the old contract it was stipulated that whenever we could divide more than 7½ per cent. among our shareholders, we were bound to reduce the price of the public lamps. It was very desirable that in the new contract we should strike out that proviso; we made it a *sine quâ non*, and I am happy to say under the new contract, we can divide whatever amount of profit we may reasonably determine upon. It may be interesting for you, perhaps, to know what are the prices charged for the public lamps by other companies. I may, therefore, tell you that in Calcutta the price is £7 4s. each per annum; in Colombo, £7 5s. 9d.; in Singapore, £6 2s. 6d. In Bombay, as I have told you, the price is £8, therefore we stand the highest. Of course, this is no measure of the actual profit realized, because in Calcutta, for instance, they can put coals into their retorts at £1 per ton. At Calcutta, however, they do not get so good a price for their residual products; their coke sells for less than ours, whereas our coke, which is a weighty coke, fetches us a good price. Under our new contract with the Municipality, we have to extend our mains about 14 or 15 miles, and we have to erect, at the expense of the Municipality, about 600 new lamp-posts. The whole of this work is to be completed by July 1 next, when the new contract comes into operation. At the same time, we propose to reduce the price of gas to private consumers, in the hope and belief that we shall thereby materially extend the use of gas amongst them. To show how vigilant we have been on this side in making our arrangements, I may state that all the lamp-posts, and almost all the mains—about 8000 or 9000 in number, have been sent out. We have no doubt that, with the aid of our active and energetic manager, we shall be able to comply with the terms of the contract, and have everything in readiness for July 1. The price of coal and freights having been low, we have taken advantage of the circumstance to the utmost extent. On June 30 last we had 11,700 tons of coal in stock, representing an expenditure of about £24,000 of our working capital. The state of the works is good, and, with regard to the current half year, the manager has written to state that everything is going on favourably on that side, and that he has as much work in hand as he can get through. The illuminations consequent upon the visit of the Prince of Wales will help us, no doubt, considerably, although the Government recommended that oil should be used for the illuminations. Nevertheless, we have had the illumination of all the great public buildings and principal places in the city, and I hope and trust we shall make considerable profit. Our prospects, therefore, for the year before us are encouraging, and, with these remarks, I beg to move the adoption of the report.

The motion having been seconded,

Mr. STOKES said he should like to make an inquiry as to the sale of chandeliers, and that portion of the stock of fittings which had been in hand so long, He also wished to know whether, when the new contract for the public lighting came into operation, the directors saw their way to the payment of the usual dividend. Further, he asked whether it was likely that the native coal would come into use for gas-making purposes, or whether the directors saw a prospect of procuring coal from any other place than England. He understood that native coal had been tried and found to answer the purpose very well in Calcutta. While making these inquiries, he wished to express his gratification with the report and the remarks made by the chairman upon the position of the company.

A SHAREHOLDER expressed a wish to have the minutes of the last meeting

read, that he might ascertain whether, upon a motion for the payment of a sum of money to the secretary and the engineer, it had been recorded that he voted alone in the negative.

The CHAIRMAN said the half-yearly meetings were not meetings contemplated by the Articles of Association, but had been conceded by the directors at the request of the shareholders, and it was not customary to read the minutes of the annual meetings at them. He also expressed an opinion that it was an unusual course to record on the minutes the number of shareholders who, upon a show of hands, voted for or against any motion, or to enter more than generally, whether the resolution was carried by a majority, or carried unanimously.

After some further conversation upon this point of order,

The CHAIRMAN, in reply to Mr. Stokes, said he was sorry to say that the stock of chandeliers had not been reduced so much as he could wish, but he believed the manager in Bombay was doing the best he could to dispose of them. His efforts, however, were necessarily dependent upon the demand. As to the prospect of future dividends under the new contract, that, of course, was a matter for careful consideration by the directors, and they entered into elaborate calculations, and had the advice of their able and experienced manager on the subject. The result was, they had every reason to believe that they should be fully able to maintain the dividends. It would be a most painful circumstance to have to go backward, but they had no apprehension of the sort; indeed, although they could not warrant it would be so, they certainly hoped to go forward with the dividend. As to the use of native coal, he understood that the Burdwan coal, at about 20s. per ton, was used in their retorts by the Oriental Gas Company; but, although that company were able to obtain about 9000 feet of gas per ton, their coke was inferior as compared with coke from English or Australian coal. The directors of the Bombay Company chartered a vessel of 600 tons, and brought a cargo round from Calcutta, but the coal did not succeed at all. They did not get so much gas from it as from English or Australian coal, and the coke was almost valueless. With the cost of the coal and the freight, it was an absolute failure.

The SECRETARY: Speaking from memory, it cost about £2 10s. per ton.

General RIGBY remarked that it had the further disadvantage of being peculiarly liable, from the presence of pyrites in it, to spontaneous combustion. When he was in Persia, the Government sent out a number of ships with it, and it was attended with great danger.

The CHAIRMAN said the directors thought it best to rely on English and Australian coal. The latter was a harder coal, and, from having to be carried a short voyage only, was obtained more freshly worked. The coke, however, was scarcely so weighty and good; but, upon the whole, the difference between the two coals was very slight.

Mr. H. P. STEPHENSON said he should like to add, with regard to the question of the reduction of price to the Municipality under the old contract, when the shareholders received a larger dividend, that although in the new contract the directors did not give the Municipality an advantage in that form, they actually had the advantage in the reduction of the cost per lamp from £10 4s. to £8.

A SHAREHOLDER said the directors had agreed with the Municipality at a fixed price for 14 years. They now proposed to give a reduction in price to the private consumers. He wished to know whether, under those circumstances, the Municipality could claim a reduction also.

Mr. STEPHENSON replied that there was a special clause in the new contract to the effect that, during the continuance of the agreement, the company should be at liberty to regulate at their option the price of gas to private consumers. They not only had the power to do so, but they had given notice of a reduction from 14s. to 12s. per 1000 to general consumers, and to 11s. 6d. for large consumers. The reason for taking the step was that they found petroleum was coming into competition with gas of late years. With a view to stimulate consumption, it became absolutely necessary some steps should be taken by way of reduction. He himself had considerable experience in respect to cheap gas, and he knew that, as a rule—speaking, of course, within limits—it would always be found that cheap gas meant increased consumption. As the chairman remarked, the directors had taken the best counsel, with the view that in future the dividends should not be decreased. They had carefully studied the question, and looked at it in all lights, and, although it must not be taken as a warranty, they had no hesitation in expressing their belief that, under the new contract, future dividends would be maintained.

A SHAREHOLDER asked whether, with the reduced price, gas would be able to compete with petroleum.

Mr. STEPHENSON said the directors would be in a better position to answer that question when they had had six months experience.

The motion was then put and carried.

The CHAIRMAN appealed to the sympathy of the meeting in reference to an officer of the company, Mr. Garwood, the late accountant in Bombay, who had recently died. He was formerly a clerk of the company in England, and having performed his duties most efficiently here, was sent over to Bombay, where he became chief accountant. Unfortunately, his health gave way, and he had to return home. During his illness the directors voted him ten guineas to defray the cost of medical assistance, intending to bear the charge themselves if disallowed by the shareholders; and now that his malady had proved fatal, they proposed to ask the meeting to vote a sum of £50 to defray his sick-bed and funeral expenses.

A resolution in accordance with the suggestion of the board was unanimously adopted.

General RIGBY then moved a cordial vote of thanks to the directors, the manager in Bombay, and the secretary.

Mr. STOKES seconded the motion, which was put and carried.

The CHAIRMAN acknowledged the vote, and the proceedings terminated.

OXFORD WATER SUPPLY.

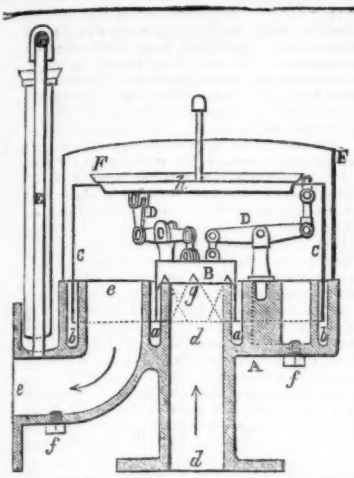
LECTURE BY PROFESSOR PRESTWICH.

On the 26th ult., Professor Prestwich, the professor of geology, delivered a lecture at the University Museum, on "The Geological Conditions affecting the Water Supply to Houses and Towns, with special reference to the modes of supplying Oxford." He commenced by remarking that he had been prompted to make that subject the text of a special lecture with respect to Oxford, in consequence of the question more than once addressed to him, the interest of which required a carefully considered answer—viz., whether geology could not indicate a source of water supply for the city free of those risks of organic contamination to which a surface supply is too often liable. Oxford, like most other towns, was for ages chiefly dependent on wells for its water supply. Two centuries and a half ago, however, Otho Nicholson, of Christ Church, in order to obtain a better supply of drinking water for the colleges, had the small springs which issue at the base of the calcareous grit on the hills above North Hinckesey collected and carried by pipes to Oxford. He also erected a fountain for the public use at Carfax cross. The supply might have been small and the water hard, but it was far purer than that furnished by the wells. The work was a most creditable and useful one, and it was to be regretted that when towards the end of the last century, owing to the increasing traffic, it was considered necessary to remove the cross, the fountain was also done away with, and more lately the supply had been altogether cut off. Were there not sufficient reasons for its restoration in other parts of the city? He understood that the spring still yielded about 10,000 gallons of water daily, and might, no doubt, be greatly increased by extending the collecting-ground. The danger of having the water from wells was great, as in such cases the water, however impure, was generally tasteless, and the natural filtration rendered it beautifully clear, while the depth is sufficient to ensure permanent coolness. He said that Oxford at present possesses a nearly complete system of drainage, and the greater number of private wells has fallen into disuse since the public water-works were established. These water-works originally drew their supply from the river below the town. In consequence of the pollution of the water arising from the extension of manufactories and gas-works, the intake of the water was removed about 20 years ago from the river to an artificial lake formed in the valley of the Thames by an old railway ballast pit. When the railway lake was first established it is more than probable that, owing to the natural filtration, the water was of good quality, while, from its indirect connexion with the river, the supply is comparatively inexhaustible. Both conditions are now greatly altered. A village has gradually sprung up on the bank of the reservoir, and all the evils of a source derived from permeable strata serving for drainage and water supply are again repeated. There are now 168 houses between the reservoir and the high road, the nearest house being at a distance of 60 feet, and the nearest cesspool a distance of only 55 feet from the reservoir. The population can hardly be less than 700. But, notwithstanding the close proximity of the village, the effect of filtration is so great that the far larger portion of organic matter may, and no by doubt does, undergo chemical changes which convert it into innocuous products by the time the matter reaches the reservoir, for the quantity of organic matter detected by chemical analysis, although larger than it should be, is not excessive. The danger of the evil may be more in the future than at present, but that the source of water supply is a contaminated source is evident. To what extent it may be injurious to health is a question for the physician. To the strong man—to the healthy constitution—it may matter but little, but it is otherwise with the delicate and the young. The great risk, however, to be apprehended is in the case of the breaking out of any contagious disease where the poison is transmitted by the water. Such a state of things might then prove very serious, and against the possibility of such a risk every precaution ought to be taken. The arrangement besides is one so repulsive that, if immediate danger does not call for its removal, moral sentiment does. The professor then proceeded to indicate other probable sources of water supply in the neighbourhood of Oxford, such as the hills between North Hinckesey and Cumnor, the water from which was formerly conducted to Carfax, the height of the springs being sufficient to carry the water by gravity to the point of delivery. A somewhat analogous structure prevails at Shotover, but he doubted whether the area was sufficiently large to furnish springs of the size or permanence required. The conditions at Oxford are such as would seem to render an Artesian well practicable, still they were somewhat obscure. Another alternative was the great perennial springs of the oolite and the chalk. He had already pointed out that a portion of the rainfall penetrates all permeable strata—that all underground water is, in fact, dependent on the rainfall. When the underground strata are charged with water, and it cannot escape by underground passages, and is not drawn off by wells, then every further addition made by the rainfall must displace part of the previous stock which necessarily overflows and escapes, and it is thus that springs are formed. In this way the large and fine springs in the inferior and great oolites of Gloucestershire, and those of the chalk hills of Berkshire and Hertfordshire, have their rise. Among the former, he might mention that one near Cirencester gives more than 20 million gallons per day, and another at Bibury, near Lechlade, yields even rather more. There are also numerous springs of good water in the vale of the Evenlode above Charlbury, but they are small. The springs issuing at the base of the chalk escarpment are numerous between East and West Hendred and Wantage, and again between Wallingford and Princes Risborough. The water is of good quality, but rather hard, and none of the springs are very large. Small villages have also gradually clustered round, and have long been in possession of most of them. These chalk hills, however, form one of the largest of our subterranean water stores; and while one portion escapes on one side at the base of the chalk escarpment, another and yet larger portion is discharged along the inner or southern side, and gives rise to larger springs, and to the several tributaries of the Thames on its left bank below Henley. This reservoir could be readily tapped by wells at a short distance from the base of the chalk escarpment; and, although the water would be hard, yet by adopting, as at Caterham, Clark's process, it might, like it, be rendered amongst the best of the waters in the London basin. The distance of all the springs is a drawback, but is it insuperable? Such are the aspects under which the water supply of Oxford presents itself: 1. There is an ample quantity of serviceable surface or valley-gravel water, which, with proper precautions above Oxford, is readily available. 2. The chances of a supply by means of an Artesian well are uncertain, both as respects quantity and quality; but the water-bearing strata are at an easily accessible depth, and the advantages of a good Artesian supply are great. 3. There are the many fine springs of the chalk and the oolites; and lastly, there are the underground springs of the chalk, though the distance to these may be considered objectionable; but some difficulties are inseparable from any project. The importance of a large and good supply of water cannot be overrated. This as a general proposition is now fully understood, and in all our large and populous towns able engineers have constructed works to secure such supplies and to do away with the abuses that were inevitable, where, as formerly, each house was the centre of its own water supply and drainage. But although the flagrant sources of contamination are generally removed from our large towns, they still too often lurk in hidden or forgotten corners, while in the hundreds of smaller towns and villages, and in thousands of country houses, the plague spot still exists in almost all its foulness and intensity. The air may be pure, the country may be smiling, the waters may be bright, the people may be cleanly, ease and luxury may prevail on the surface, but below that surface a poison is, by a delicacy which is not unnatural, hidden out of sight, unknown to most, often kept in subjection for years or working so insidiously as to raise no suspicion; but there it is ready, when the opportunity offers, to fix on its prey, and to spread disease and death around. The blow, in fact, is often so covertly given that neither the sufferer nor his friends suspect when or whence it comes. The great outbreaks are exceptional. They unavoidably attract attention; but it is a question with me whether the sum of the minor resultant evils do not outbalance the more prominent cases. Against these many risks it seems nobody's business to guard. The evil is so widespread and so deep-rooted that he apprehended nothing less than legislative action would be able to effect a cure, and protect an unwitting population from conditions over which they in general have no control, and of which without special inquiry they cannot possibly have any knowledge.

GAS EXPLOSION AT GOOLE.—Early on Saturday morning, the 20th inst., an explosion occurred at the Goole Gas-Works. An escape suddenly arose from the syphon well, and though it was speedily detected and stopped, the wind carried a large quantity of gas into two adjoining houses. In one it was ignited, it is supposed, by the smouldering fire in the grate; the windows were blown out, and other damage done. In the other house the explosion was less violent, but some clothing was burnt.

SHREWSBURY GAS COMPANY.—At a special meeting of this company on the 18th inst., it was resolved that the directors be authorized to raise, for the purposes of the Shrewsbury Gas-Works Act, 1857, the balance unissued of the capital, £40,000, by the creation of 500 new shares of £10 each, and that such shares be offered at par *pro ratâ* to each proprietor of existing shares, in the proportion of one share for every seven shares now held. It was also resolved that an instalment of 25 per cent. should be paid on such new shares on or before the 18th of January next.

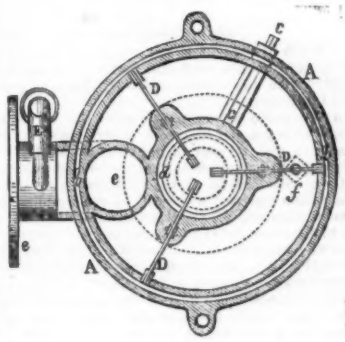
LIEBDA'S GAS-REGULATOR.



The annexed illustration, extracted from the *Bulletin du Musée*, represents a novel gas-regulator, recently devised by M. Liebda. A cast-iron vessel, A, is provided with circular channels, *a* and *b*, which are filled with mercury; *c* is a conduit for emptying them. The gas enters by tube *d*, and escapes by tube *e*; and at *f* are screw-plugs, which close the apertures, from which the water which accumulates in the apparatus is removed.

The entry of the gas is regulated by a valve or cover, B, the edges of which, as shown at *g*, are triangularly indented, and are plunged into the mercury in the channel *a*. A large cover, C, is provided, the edges of which enter the mercury in channel *b*, and at *h* access may be had to the interior. The covers, B and C, are connected together by the three double levers, D. E is a water manometer for indicating the gas pressure, and, finally, F is the envelope which encloses all the working parts.

The gas on entering *d*, passes under B, and through the triangular indentation in the edges of that valve. It then presses upon the large cover, C, and, by raising or lowering the same, causes the reverse effect upon B, through the levers, as already noted. As the pressure increases, cover C rises and A falls, and *vice versâ*, thus causing the apertures in B to widen and close just so as to admit a uniform flow of gas. To increase the pressure, weights may be disposed upon the cover, C. An economy of from 25 to 30 per cent. is claimed to be gained, in the consumption of gas, through the use of this device.



EFFECTS OF THE RECENT FLOODS AND HIGH TIDES ON GAS-WORKS.

Reports from various parts of the country have been published respecting the damage done to gas-works, and the interruption of the gas supply, by the high tide of a week or two ago, and also by the prevailing floods in many districts. We have already referred to the case of Darlington, where, at the close of last month, the river Skerne overflowed its banks, and, putting out the fires at the Corporation Gas-Works, deprived the town of gas for some nights. The effects of the high tide of Monday, the 15th, were severely felt at Sittingbourne and other places near the Thames and Medway. The *Chatham and Rochester News* gives the following account of the consequences at the works of the Chatham Gas Company:—

"The most serious result of the flood—as affecting a vast number of persons—was the temporary stoppage of the supply of gas to Chatham, Rochester, and Strood, and to some other parts of the district, through a special disaster at the gas company's works on the banks of the river at Rochester. The works at Gillingham were not stopped, and from these a supply of gas continued to some places—to the convict prison, some of the barracks, part of the dockyard, and part of Old Brompton, and to New Brompton and Gillingham; but to have attempted to give any of this supply to Chatham, &c., could only have resulted in no one having a supply of any use to them, so arrangements were made to supply the places named.

"When the great tide of March last year inflicted so much damage in our district, the gas-works at Rochester, though surrounded with water (the meadows of the common being converted into a great lake), were not affected, and the town did not suffer from lack of gas. The flood on Monday morning, Nov. 15, was deeper than that of 1874, and, unfortunately, from the flooded meadows the water not only penetrated into the gas-works, but caused two special disasters: the fires in one retort-house—the older one—were extinguished by the flood, and the manufacture of gas there stopped, and the flood overtopped the defences of the gas-regulator house, and thus poured into the two large mains which supply the towns, effectually stopping the supply of gas to the district; the mains were filled with water instead of gas, and what gas was in the gasometers could not enter the mains. The disaster was quite unexpected; the men were at work in the old retort-house, the furnaces glowing, the retorts charged, gas being made, when the alarm was raised that the tide was coming in, and ere long the flood rushed into the retort-house, extinguishing the furnaces, swamping the retorts, and causing the whole place to present a most alarming appearance; as may be imagined when tons of water were coming into contact with a row of red-hot furnaces and retorts, immense volumes of steam being created, and filling the large building. Happily no personal injury was sustained, but the furnaces, the brickwork, the retorts, &c., have been greatly damaged, inflicting much loss upon the gas company.

"The self-acting regulator is a machine which regulates the pressure of the gas so that the public may have a regular pressure. The machine stands in a building by itself. After the flood of 1874, extra precautions had been taken to prevent water entering. But these proved unavailing. The water, we believe, entered in various ways, and the building and regulator were flooded. Of course the regulator is in connexion with the mains; and the flood poured into the mains. On Monday morning the gas company issued notices announcing that, from the inundation of the works by the extraordinary tide, there could be no supply of gas till further notice. We have spoken of the two serious mischiefs caused by the flood at the works; they were not the only ones—nearly the whole place was flooded—coal and coke washed about, buildings swamped, houses and offices placed amid lakes or the ground-floors deep in water—'water, water everywhere,' and a good deal of mud when it subsided. The aspect of the place was indeed miserable. Fortunately, the new retort-house, built on a higher level than the older one, was not flooded; so that when needed it was ready to be used.

"The officers of the company did all that could be done under the circumstances, but they were powerless before the strength of the flood, which did not come over the river-walls of the gas-works, but from the marshes surrounding the works; but after the mischief had been done, vigorous efforts were made to expedite a renewal of the supply of gas—Mr. E. Winch, the chairman, and the directors, Mr. Syms the secretary, Mr. Vanheson, the manager of the gas manufacture, Mr. Bird, and indeed all the officials, doing their utmost to give the towns a supply of gas as early as possible. When the disaster occurred, the secretary was roused at the office in the High Street at two o'clock in the morning; to get to the works, he had to take a boat from the Town Quay the road by the Common being impassable.

"As the tide fell, and at succeeding low tides, the water was largely let off the meadows by sluices, and by midday on Tuesday a great quantity had been got rid of. To clear the gas-mains of the water, a number of pumps were applied at the various 'syphons,' or reservoirs used for collecting liquids deposited from the mains. By constant labour and attention, the mains were slowly cleared of the water, and by one o'clock on Tuesday, midday, much of the water had been got out.

"For resuming the supply of gas to the towns, on Tuesday the furnaces in the new retort-house, built in 1865, were lighted, and at noon we saw the heated retorts being again charged with coal—a gratifying sight to a considerable consumer of gas. Matters looked more cheering.

"Of course great inconvenience was caused by the sudden stoppage of the gas supply. Factories and workshops and many shops were closed when daylight departed; other shops were lighted by lamps or candles; the streets were dreary from want of the light of the street-lamps. Fortunately the nights were moonlight. But the want of gas was not long felt. On Tuesday, Strood, Rochester, and part of Chatham were again lighted; and on Wednesday evening the supply was again general to workrooms, shops, and houses—a great comfort."

At the Fulham works of the Imperial Company, in consequence of the giving way of the Thames bank, the works were inundated, filling the coke vaults to a depth of 5 feet, and doing a considerable amount of damage.

On Sunday, the 14th, a gasholder at Southwell was partially overturned by the wind, so that the town was without gas all night, and religious services were suspended.

EXTENSION OF THE SOUTHPORT GAS-WORKS.

Mr. George Anderson has made the following report to the chairman and Gas Committee of the Borough of Southport, on the proposed extension of the gas-works of that town:—

Gentlemen,—I now beg to lay before you my report on the several questions which we reviewed verbally at your meeting on the 26th inst.

First.—Capital to be sought in proposed application to Parliament.

I find that in 1855 your capital was £7249, in 1865 it was £14,210, and now in 1875 it is £78,868. These figures show a very rapid increase, especially during the last ten years. I have inquired into the amount of business done, and here the increase is still more rapid. In 1855 you made 5,500,000 feet of gas, which was at the rate of one million feet of gas for every £1318 of investment. In 1865 you made 28 million feet of gas, which was equal to one million feet of gas for £507 of investment. At the present time your make is at the rate of 140 million feet of gas, which is at the rate of one million feet of gas for £562 of investment. Up to 1855 your capital in proportion to your business was large, for it was considerably over £1000 per million. Now, it is very small, for it is only about £600 per million, whereas £750 is a usual sum in other places.

On the matter of past expenditure I am satisfied that you have a good case to present to Parliament.

Touching the amount of money you should apply for as applicable to gas, we have to consider that during the last ten years your business has increased five-fold, while your capital has increased a fraction over four-fold. Should your business increase at the same rate during the next, as it did during the past ten years, and your investment in the same proportion, you would require a sum of £315,472. I am informed that the town is increasing as fast at the present time as it has done at any former period; and I could see for myself, from the great number of houses being built and enlarged, that it is increasing very fast indeed, and when your system of sewerage is carried out, one may suppose that it may even increase faster. On the other hand, Parliament generally desires that applications from the same place and for the same object should not come oftener than every tenth year, because applications to Parliament cost money, and they occupy its time.

Keeping the whole of the preceding matter in view, my opinion is that you should apply for power to raise, as it may be wanted, the sum of £300,000, including your present powers. Of this sum you may require £40,000 for the extensions now in hand, and those which are proposed for next year, including a retort-house, more purifiers, coal store, enlargement of leading main-pipes and a second engine, exhauster, and steam-boiler.

You also require another gasholder and tank, and it should be of much larger dimensions than those previously erected, so that your works may not always be in a state of transition.

Your retort-house should be commenced without a moment's delay, for you will have every retort in action this winter, and no gas-works should be without a per centage of spare retorts in case of accident.

The gasholder-tank should be commenced as early next spring as the weather will permit.

You have only at present storeage for three-fourths of a day's consumption of gas, which is as little as you should have to enable you to work with economy of manufacture; but at the rate your business is increasing, it is questionable whether it will be equal to one-half of a day's consumption of the winter, 1876.

With such a state of things you would have to keep more retorts in action than with sufficient storeage would be necessary, which increases the cost of labour, and also renders it more difficult to dispense with any Sunday labour, an amelioration which I presume you would like to extend to the men as far as practicable.

You should have your exhausting machines in duplicate, as is usual in other gas-works. If an accident occurred to your present exhausting machinery your make of gas would decrease at once 10 per cent., and at the present time such an event would prevent your being able to adequately supply the public.

Accompanying this report I sent a cross section of the retort-house. I propose it should be built in a line with the present one, so that should you adopt a mechanical stoking machine, there may be a sufficiency of retorts in a line to fully occupy it. I propose that there should be a roadway between the ends of the present and the new house, so that the present lines of rails may remain and serve both houses; also that it shall be of sufficient width to permit the coal waggons to deposit their loads opposite the retorts, and thus save a second handling of the coal.

The details necessary to carry out these extensions are of the first importance, that the outlay may result in a judicious expenditure of capital. They are numerous, and require forethought before the expenditure commences; you should therefore lose no time in putting the work into the hands of your engineer.

I called at the gas-works in Manchester on my return, but the stoking machines were not in action, so that I could not report on them.

The house, a cross section of which accompanies this report, will do for ordinary working or for machine work, and I shall be glad to have the drawings for confirmation as soon as possible.

London, Sept. 25, 1875. GEORGE ANDERSON.

THE PRINCIPLES ON WHICH LEGISLATION RESPECTING THE POLLUTION OF RIVERS SHOULD BE BASED.

[Abstract of a paper read at the Social Science Congress of 1875, Oct. 13.]

By Dr. CORNELIUS FOX,
Health Officer of East, Central, and South Essex.

So much has been written and spoken relative to the great question of the pollution of rivers, that the minds of legislators and scientific men must be wearied with the whole subject. That the people of this country think it a very important one, and desire earnestly that some satisfactory settlement may soon be arrived at, cannot be doubted. To many it is a question fraught with danger to trade, and therefore to be opposed in every shape and form. And yet every one who has ever thought on the matter would, I believe, freely acknowledge that to convert our streams into open sewers is very unwise in every sense of the word. The public have apparently ranged themselves into two classes on this question, as they do on almost every public one—those, consisting principally of manufacturers, who oppose legislation having for its object the prevention of the pollution of rivers on the ground of its interference with trade, and another class who advocate their restoration to the condition of trout streams. To permit the filthy inky watercourses of the manufacturing districts to remain in their present state is to allow a few score of men to afflict thousands with gigantic public nuisances. To queitly sanction the pollution of 3 million gallons of river water daily by five firms, as at Bradford, and to complacently allow 75,000 tons of cinders to be annually deposited in the river Irwell, is of course suicidal policy. To argue that, because manufactories which pollute streams and air give sustenance to hundreds and thousands of workpeople on their banks, whose vital energies are lowered (thus rendering them a more ready prey to disease) and whose offspring are stunted and depraved by the unwholesome influences to which they are subjected—to argue, I say, that, because these great industries fill the stomachs of these people, they ought not to be required to be conducted in a manner which is not detrimental to their health, shows a want of all proper feelings of humanity. Whilst, however, condemning an extreme degree of pollution, I do not, like many, think that it would be wise to be too exacting as to purity.

Those who are acquainted with the practical working of the Sanitary Acts, and are engaged in an incessant warfare with the development and spread of preventible diseases, know full well that the principles on which all their work rests consist mainly in the prevention of air pollution and of water pollution. Filth in the air we breathe, and filth in the water we drink, is the one great enemy, in two different media, against which we health officers are always fighting. As the question of the pollution of rivers is primarily and essentially a sanitary one, and secondarily a commercial or pecuniary one, why, I ask, should not the same principles be applied in dealing with it as with all other sanitary evils which involve exactly similar considerations? It will, I presume, be acknowledged that for legislation on this question to be possible, all extremes must be avoided. To advocate the restoration of our streams to a state of purity resembling that of a mountain rivulet is to obstruct and in fact to oppose all legislation on the matter. The crippling or destruction of many industries of national value would necessarily follow such an enactment, for the expenditure incurred in purifying their waste waters would consume or most seriously affect their legitimate profits. I maintain, moreover, that, if it were possible, it would be force wasted, for no adequate compensatory advantage would be gained. All who have paid attention to the very interesting topics as to the effects on health of various kinds of water, agree that spring water is to be preferred to all other kinds, and that river water *un*polluted to any extent by sewage needs more or less of purification by filtration, &c., which is costly, before it is fit to drink. The Duke of Somerset placed the matter in its true light when he recently said in Parliament: "The foul matters encumbering streams may be got rid of, but the notion of their supplying water fit to drink must be altogether put aside. Towns must be supplied with pure water for drinking purposes in some other way." As the prevention of the pollution of the foulest of our streams would seem to necessitate the stoppage of important industries, and the purification of such streams so as to render them adapted for drinking purposes is of course not to be thought of, let us ask ourselves the questions—(1) What harm do these streams corrupted by sewage and trade products do; and (2), How are they to be prevented from inflicting injuries?

(1.) *What Harm do these Streams corrupted by Sewage and Trade Products do?*

(A.) *Many of them pollute the air lying over them and on their banks.* Noxious odours sometimes or always arise and annoy those who live near them, or those living at a distance who approach them. If human beings are exposed frequently to unpleasant smells, a deleterious influence is exerted on their health. I know all that may be said in opposition to this statement. I shall be referred to the absence of any noticeable evil effects in London during the year when the Thames was so odoriferous, and to the supposed immunity from cholera and other preventible diseases of the sewer men of Paris, &c. It is a well-established rule, to which there are some apparent exceptions, that there is a greater mortality amongst those who are exposed continually to offensive odours than with others who are not so circumstanced, and that the diseases from which the former suffer are of an asthenic type, and tend to death rather than to recovery. A certain amount of *vis medicatrix naturæ* is lost by them, and its want is felt at critical periods of sickness when most needed. Evaporation is constantly in a greater or less degree proceeding from the surface of water, and organic impurities contained in the water, if excessive, are mechanically conveyed into the air during this process of vaporization. The odours of many of these rivers, like those of foul ponds, are generally noticed more at sunrise and sunset that at other periods of the 24 hours, in consequence of the descending dew preventing their diffusion and rendering the impurities soluble and thus more perceptible to the sense of smell. My experience as a physician has taught me that it is prejudicial to health to frequently breathe air polluted by emanations from very foul water. Unpleasant smells are danger signals, and although it is absurd to fear an attack of illness whenever we have our olfactory nerves offended, yet there can be no hesitation in saying that the continual exposure of the human frame to polluted air tends to engender ill-health, even if it does not create disease. The contamination of the air by many of these streams is as great a nuisance (taking this word in both its literal and legal or popular sense) as the pollution of the air by volumes of smoke, which is, subject to some saving provisions, an actionable offence.

(B.) *Many of them destroy fish.* Certain kinds of fish, such as the trout, require, in order to live, water of great purity. Others, such as chub, dace, roach, jack, barbel, perch, pike, eels, &c., flourish in water which would be considered comparatively dirty, whilst no fish whatever will, I believe, live in some of the most impure streams, and in those poisoned by the metallic waste of mines. In rendering streams so foul or poisonous that no fish can exist in them, certain manufacturers and miners damage one of our food resources, by rendering an important article of diet scarce and dear, and therefore not to be procured by the poor man, thus lessening the self-reliant powers of the country.

(C.) *Silting up of watercourses and obstruction to navigation.* The quantities of solid impurities thrown into some streams are so great as to fill up their beds, thus creating inundations of their banks higher up. These solid matters produce a silting up of rivers, and an obstruction to navigation by the accumulation of offensive banks of mud. On public grounds these evils should be rendered impossible.

(2.) *How are the Streams to be Prevented from Inflicting Injuries?*

The injuries being the pollution of the air (for no one ever thinks of drinking such water), the destruction of all kinds of fish, or an obstruction to navigation, and to the escape of surplus waters during flood, my answer is simply and solely the following:—Let our scientific chemists ascertain the point at which a stream begins to be so impure as to contaminate the air lying over it, and here let a line be drawn. Let them ascertain the point at which a water becomes so impure as to prevent life and multiplication of the less particular of the finny tribe, and here let another line be drawn. Let them ascertain the amount of suspended impurities a stream may contain without depositing in its course sufficient to offer at some future time an obstruction to the ready escape of flood waters and to navigation, and here draw a third line. Whether these lines would coincide or not, I do not know. Probably not. The nature, as well as the quantity of the impurity, would have to be considered in a question of this sort, the rapidity of the stream, and many other matters. Standards of some kind we must have, as well for the protection of the innocent as for the ready conviction of the guilty. To attempt legislation without any definite rules for guidance would be to court a failure. I maintain, then, that, instead of establishing such impracticable standards as were recommended by the Rivers Pollution Commission, we should adopt three simple standards of the kind just indicated. No stream should corrupt the air lying over it or on its banks, under any conditions of air pressure, temperature, or humidity, or level of its waters; for, if it does, it is detrimental to the health of those living near it. No amount of impurity in a river should be tolerated which would injure one of the food supplies of the people—to wit, the less dainty feeders amongst our river fish. No stream should contain so much suspended impurities as would tend to its obstruction in time of flood, and to the silting up of the mouths of navigable rivers. As for the practice in some parts of shunting large quantities of cinders, ashes, and solid refuse into streams in order to avoid the expense of carting them away, and of placing solid matters on the banks of rivers, so that they may be washed into them in times of flood, such proceedings should be rigorously prohibited by law as being injurious to public interests.

As regards the pollution of *tidal* rivers, the law, as it at present stands, is not in accordance with the spirit of the rest of sanitary legislation. It is illegal to pass any filth into a tidal river according to the Public Health Act of 1875. If filth is passed into a river, and any one can show that he is injured thereby, the health authority of the district is liable to an action at law. Some rivers are guarded by conservators or water bailiffs, whilst others are not so cared for. How are the silting up of the banks of tidal rivers, and the accumulation of filth interfering with navigation, to be prevented in the case of rivers not fortunate enough to be possessed of guardians? It is of no use to forbid a thing whilst unpossessed of any power to prevent that which is forbidden from being effected.

To establish three simple standards of the kind which I have suggested is to extend the sound principles of sanitary law, the burden of which is that you shall do nothing which is injurious to the health of your neighbour or to the public welfare.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The past week has been a very broken one in almost every branch of trade in this town, owing to the Sheffield Winter Fair Holidays, which have been the cause of almost all the iron and steel works (as well as the collieries) being stopped. This stoppage, which has averaged about three days, cannot be said to have been unwelcome to the masters in any department of industry, and it has doubtless been particularly acceptable to the coalowners, who are suffering not only from a plethoric supply, but an indiscriminate competition. That this would be the case had long been foreseen, and, indeed, was inevitable, when the great number of new colliery undertakings was taken into consideration. In the present depressed state of the iron and steel trades, it is clearly and indubitably impossible for the whole of the coal output to be got rid of at high prices. It is equally impossible for those who have sunk so much capital in these new pits to go without interest for their money, hence we find that there is a brisker and keener competition than at any previous period in the history of the local coal trade. This competition is not by any means confined to the immediate neighbourhood; on the contrary, it extends to the Lancashire, Staffordshire, and Metropolitan markets, all of which are now experiencing the effects of South Yorkshire and North Derbyshire competition. The struggle will doubtless become even more vigorous as soon as the Great Northern shall have completed its arrangements for fighting the Midland in the very heart of the Derbyshire coal-field. Meantime the South Yorkshire colliery proprietors are trying to induce the officials of the Manchester, Sheffield, and Lincolnshire Railway Company to provide greater accommodation at Keadby, and do not despair of success, as the matter is under serious consideration. Should this be conceded, they will be able to gain and keep a stronger foothold in all the east coast markets, as well as in London itself, for steam and best house coal.

In consequence of the holidays, to which I have already alluded, there have not been many sales, either of pig or merchant iron, during the week. Pig iron has a rather weaker tendency all round, but merchant iron is steady, although it cannot be said that there is anything in the demand to warrant any further augmentation of prices.

The brassfounders have still an unusual amount of work on hand, the call being chiefly for plumbers water and steam fittings. Various improved contrivances for preventing the waste of water have recently been introduced, and are being largely used by water companies, such as Sheffield, Norwich &c., who have obtained compulsory regulations to that effect.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is little change to report in the general aspect of business. The demand for iron continues very slow, and manufacturers complain of the very slender profit obtainable at current rates, yet any attempt to establish a higher price invariably checks business. The demand for plates is extremely dull, and this class of iron is being imported from the North of England districts at a reduction of £2 per ton on the rates now ruling for South Staffordshire makes. The local trade for medium and common iron is, therefore, not likely to improve at present. The failure of the Parkfield Iron Company, with liabilities roughly estimated at £50,000, has produced some uneasiness, though beyond the further restriction in the make of pig iron, this district will not be directly affected by the disaster to any extent, the largest creditors either being well secured, or well able to bear the impending losses. For pig iron the quotations range from £3 per ton for common cinder to £4 17s. 6d. for best native all-mine hot air. Production is being much curtailed in this department. With the exception of sheets, which continue in moderate request, finished iron is in very restricted demand. Prices for common qualities are on the basis of £8 5s. for bars, and best branded bars are steady at £10, other descriptions being in the usual proportions to these rates.

In the coal trade there is a well-sustained inquiry for best household qualities, particularly in the Cannock Chase district. Around West Bromwich best thick coal is in greatly restricted output, in consequence of the recent heavy floods, and fuel is in rather scant supply.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

All descriptions of round coal still meet with an active demand, and the supplies in the market of good qualities are rather under than in excess of requirements, whilst stocks continue to be filled up, and prices are stiff. There has been no material quotable alteration in rates since my last report; but in some

quarters a small advance upon the best seams is talked about at the end of the month, and if the winter is at all severe, there will be little difficulty in obtaining these, as stocks are now low; but whether higher prices can be maintained, when the present push for winter supplies is over, is doubtful. In the Manchester market good classes of furnace and engine fuel are a trifle steadier, as they have been more drawn upon for house purposes, but generally throughout Lancashire burgy and slack are plentiful, and weak in price. In common sorts late prices are scarcely maintained, and in the Wigan district common burgy is quoted as low as 5s. 9d. to 6s., and common slack, 3s. to 3s. 6d. per ton at the pit mouth.

For gas coal there has been a very fair demand, but this is in some measure attributable to a considerable consumption of this class of fuel for house purposes. Gas consumers, however, are buying tolerably freely where contracts have not been made, and good screened coal at the pit is worth from 11s. to 12s. 6d. per ton.

Coke is now a complete drug in the market, and business is confined to its narrowest possible limits.

The iron trade of this district continues very depressed, and there is comparatively little business to report for the past week beyond a few purchases of forge pig iron, which is a trifle firmer in price. There seems to be an impression that prices have now reached their lowest point, but at present this does not appear to materially affect buyers in giving out their orders. Makers, however, are less disposed to make concessions, and do not care to push forward sales. The nominal quotations for Middlesbrough iron, delivered into this district, are about as under:—No. 3 foundry, 57s. 9d.; No. 4 foundry, 56s. 9d.; No. 4 forge, 55s. 9d. to 56s. 3d. per ton. Lancashire makes are about 62s. 6d. for foundry, and 60s. to 61s. per ton for forge. Finished iron is rather weaker. Middlesbrough bars, delivered, being quoted at £7 12s. 6d. to £7 15s.; and Staffordshire at £7 17s. 6d. to £8 per ton. Rails are about the same, light sections being £7 10s., and heavy ditto, £7 5s. per ton, delivered.

There is no change to report in the position of works.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The household and gas coal trades of this district still keep firm. Some large contracts were made upon Newcastle Quay last week for best gas at 9s. per ton for next year. The gas-works and merchants in the small ports of the South of England are likely to be inconvenienced a good deal by the detention of sailing vessels. The weather was very stormy last week. The wind was from the north and north-east, and, of course, no light ships could get down to the coal ports to coal. A good few small orders for gas coals could not be completed for want of handy sailing tonnage. The same observation applies to household coals. The gas-works in the districts accessible to steamers will experience no difficulty with regard to supplies, as there are plenty of coals to hand, and a very active trade is done with steamers in gas coals from Tyne Dock. The steam coal trade of Northumberland is in a very deplorable condition. The collieries have not wrought so badly for years as they are doing now. Some pits are not working more than two days a week, and taking the steam collieries as a whole, the average will not make more than half time. Quotations continue, as has been reported for several weeks, irregular; and second-class steam coals are offered at what they will fetch in the market, without reference to card prices. There has been an inquiry for blacksmith's coals from France and Hamburg, but prices are very low.

Coasting shipping rates advanced 10s. more a keel last week, and some of the rates were as follows:—Totnes, £11; Teignmouth, £9 10s.; and the French ports, £10 10s. a keel; Dublin, for gas coals, £11 to £11 10s. per keel; Yarmouth, Lowestoft, and Lynn, 6s. per ton; Wisbech, 7s. 3d. per ton. A considerable fleet of small coasters would find ready employment were they to hand in the coal ports.

The iron trade of the Cleveland district and North of England generally is extremely dull. There is much short work, many men out of employment, and most kinds of iron are very low compared with what they were two years ago. Despite of the stagnation of trade, all kinds of building materials are in demand. Whilst a small warehouse order for £50 worth of iron would be gladly taken by establishments which, in good times long ago, would not have looked at any order for £1000 worth of iron, large orders from the Continent for slates and such like building materials have been declined.

The chemical trade is in an extremely depressed state, and it has been agreed to close the large factories for a fortnight at Christmas.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Further reductions in the price of gas continue to be made here and there. This week it has been announced that the directors of the Linlithgow Gaslight Company have resolved to reduce the price from 6s. 8d to 5s. 10d. per 1000 cubic feet, the reduction to commence on the 1st of January next. It is likewise announced that the directors of the Helensburgh Joint-Stock Gaslight Company have agreed to grant a further reduction of 5d. per 1000 cubic feet from the November survey, thus making the price, I believe, 5s. 10d. per 1000 cubic feet to ordinary consumers, and 5s. to the public lamps. No fresh steps seem to have been taken to bring into active condition the new gas company that was launched some months ago in the town of Helensburgh; it is in existence, but apparently nothing more, and it is reported that the general public are not in favour of it.

The gas consumers of Cambuslang, a large and thriving village lying a few miles to the south-east of Glasgow, have lately been expressing a good deal of dissatisfaction both in respect of the high price and the inferior quality of the gas supplied to them by the local company. A proposal is hinted at which may cause a change if carried out. It is that of obtaining a supply from the Glasgow Corporation Gas Commissioners, which, it is believed, would prove a boon to the consumers if it could only be secured. It is just possible that some overtures may be made to the Gas Commissioners.

The proposal to erect new works by an opposition gas company for Bothwell and Uddingston has not received its *quietus*, and yet it seems strange that any sane persons should propose to go on with an opposition scheme, when it is considered that the existing company supply gas at 5s. per 1000 cubic feet, and give gas free of charge to 66 street-lamps.

As I write these "Notes," I learn that the complaints about the quality of gas in Paisley were based on a very slender foundation. On account of excessive heats upon the retorts lately, the gas was not quite so good for a couple of nights as it should have been, but still it was never below the parliamentary standard of 25 candles. One of the most inveterate complainers seems to have made the not uncommon mistake of confounding quality with quantity, the supply-pipe to his works through some private property being much too small for the quantity of gas required.

The question of properly assessing gas companies for public rates occasionally crops up in Scotland. The latest instance is a complaint made by Mr. James Whyte to the parochial board of Kilbarchan, on the part of the Bridge of Weir Gas Company. He argued that the works should be valued and assessed in the same way as agricultural lands, but he was informed by Sir Robert J. M. Napier, Bart., who presided, that it could not be done, and that if he wished any alteration in the valuation, he must appeal to the assessor or the Registration Court.

The deputation appointed at the public meeting spoken of last week as having been held at Dunfermline, to oppose the Glen Devon water scheme, have been received by the Town Council, but the provost completely demolished their arguments in favour of the Craigluscar supply.

A new water supply scheme for Lossiemouth, Branderburgh, and Stotfield has been proposed, and the Water Committee of the local authority have resolved to borrow a sum of £3000 from the Public Works Loan Commissioners for the purpose of carrying it into execution.

A scheme is on foot for the purpose of securing an adequate supply of good water for the inhabitants of Buckhaven and Coaltown, or Wemyss, in Fifeshire. The proposed gathering-ponds will occupy fully 30 acres of land.

It may be said that the Dour scheme has carried the day in Burntisland, the plebiscite giving a majority in its favour. The majority, however, was so small that the Town Council have resolved to ask the Board of Supervision if, under the circumstances, they would be justified in proceeding with it. The Aberdour authorities ask to be allowed to participate in the benefits of the scheme when carried out.

The Largs Local Authority have now resolved upon what scheme of water supply they will have, and are determined to proceed with it as expeditiously as possible. They have already marked off the area of the water supply district.

There have lately been some large shipments of cast-iron pipes from the Clyde to Melbourne, Bombay, Odessa, and other places, but, on the whole, there are not at present any important contracts in prospect. One order has just been secured by a Glasgow firm, for a Canadian water company, of upwards of 1000 tons of pipes, up to 9 inches in diameter.

The Glasgow pig iron warrant market has been strong one or two days lately. As high as 61s. 10½d. prompt cash, and 62s. 1½d. one month, was paid on Thursday, but on Friday the prices were somewhat lower. No further change is announced in makers prices.

Coal has been rather more in request for immediate shipment during the past week, the cranes at Glasgow Harbour having been fully employed. House coal is in demand, and maintains the late advance in price. Gas coal is also a good deal firmer in price than it was. Coalmasters are expecting a rise in the rates for all descriptions.

HARROGATE GAS COMPANY.—Some time ago the Harrogate Gas Company appealed against the valuation placed upon their property by the Knaresborough Union Assessment Committee, on the ground that it was an excessive charge, and the result was, the matter was referred to Mr. Joseph Smith, of Bradford, as arbitrator. The valuation made was—Annual value of the company's works and mains, £790; rateable value, £592 10s. The arbitrator has just made his award, which is as follows:—Gross annual value, £1012 6s.; rateable value, £697 19s. Both parties to pay their own costs of reference, but the costs and charges of arbitrator and accountant, and costs incidental to the preparation of the award, to be paid by the company.

SHEFFIELD WATER-WORKS COMPANY.—An extraordinary meeting of this company was held on the 22nd inst., at which it was resolved—"That the directors shall, from time to time, as they think expedient, borrow under the powers of the Sheffield Water (New Works) Act, 1867, any sum or sums not exceeding in the whole the sum of £55,333 6s. 8d., being the third or last one-third part of the sum of £166,000 which the company are by the said Act authorized to borrow, or any part of such sum of £55,333 6s. 8d." "That the directors shall, from time to time, as they think expedient, reborrow on mortgage, under the powers of the Sheffield Water (New Works) Act, 1867, any sum, part of the sum of £55,333 6s. 8d. by the first resolution now passed authorized to be borrowed under the powers of the said Act, which may hereafter be paid off."

Register of New Patents.

4297.—BINNIE, R., London, "*Improvement in condensing apparatus for steam pumping-engines.*" Patent dated Dec. 14, 1874.

This improvement consists in discharging the steam into the suction-pipe of the pump through an annular passage, in order to bring the whole of the steam as much as possible in direct contact with the water, thus causing instantaneous condensation.

4305.—SCOTT, H. Y. D., Ealing, "*Improvements in the treatment of sewage and nightsoil.*" Patent dated Dec. 14, 1874.

The object of this invention is the treatment of sewage in such a manner as to deodorise its fertilizing constituents without degrading their value. The process is applicable to town sewage as well as to solid fæces. By the mode of treatment now proposed, the carbonate of lime precipitate obtained being unmixed with siliceous and argillaceous particles, can be reburned and reused for the precipitation of fresh portions of sewage.

4326.—ALLAIRE, P. L., Paris, "*An improved manufacturing lighting gas by employing petroleum, schiste, or other mineral or volatile oils.*" Patent dated Dec. 16, 1874.

The fundamental principle of this apparatus resides in the formation of the gases by means of two hollow spheres or vessels with interior curved surfaces, one of which serves for the vaporization of the liquid, and the other for the decomposition of the vapour supplied, to obtain a rich gas at a moderate price, and having a very remarkable lighting power.

The petroleum contained in an upper receiver descends by a pipe with regulating cock into the first spherical vessel, where the vaporization takes place at a temperature of about 200 degrees. From the vessel the vapour passes into a vessel heated to about 900 degrees, in which the vapour decomposes; that is to say, where the separation of the non-volatile products from the gas properly so called takes place. The residuum of the decomposition remains at the bottom of the vessel. The grating of the fire-place is placed beneath the vessel, and the smoke escapes by a lateral flue. Man-holes are provided following the curved surfaces of each of the vessels, and the entire arrangement is supported by a casing. Thus produced, the gas escapes by any suitable conduit to the refrigerator, having a worm or tubes with end chambers, and containing a certain quantity of water. From this apparatus the gas is sent to the gasholder.

4363.—GILL, D., Weston-super-Mare, "*An improved method for relieving private drains of sewer or drain gas.*" Patent dated Dec. 18, 1874.

The apparatus constructed according to this invention consists of two compartments, one above the other, secured together by suitable means. The upper being made removable to get at the drain eject and the lower compartment having an opening (with movable grating to stop rats) at the bottom into the drain eject, and another opening above it, into the upper compartment, and in one of its sides is a circular opening to which is attached an effluvia escape-pipe from the private drain. In this opening is a ring rounded in section, or the edges of the opening may by rounded instead, and inside the compartment in the front of this opening, a wedge-shaped valve is placed with a hollow ball made on it either spherical or spheroidal, which falls by its own gravity and closes up the circular opening, thus preventing ingress of sewer gas, but by opening with any little pressure behind it allows the escape of effluvia from the private drain to the main. This valve has a rounded edge at bottom to rock upon, with pins and slots to keep it in position, and stops on the sides of the compartment to prevent its getting beyond its gravity. The upper compartment consists of a shaft with an opening and cover on top at one part; and the other part, consisting of a water-trap the bridge of which dips into the water in the proportion of two

thirds to one-half that of the drain eject, thus forms the weaker trap for the escape of the sewer gas. At the upper part of this trap is an opening from which a pipe is carried up to a proper elevation against a chimney-stack, roof, or other support for the discharge of the gas into the open air. This water trap can be kept filled by any suitable means.

4365.—SPICE, R. P., Parliament Street, Westminster, "*Improvements in the manufacture of gas.*" Patent dated Dec. 18, 1874.

This invention relates to the manufacture of illuminating gas, when what is commonly known as "water gas" is used in combination with the vapour of petroleum or other similar spirit or oil.

The apparatus to be employed is not necessarily, but greatly by preference, that for which letters patent, No. 4178, Dec. 19, 1873, were granted to the present inventor, and these improvements consist in causing the gas, immediately after it has left the condenser, or direct from the retorts, and while it is hot, to pass through a vessel containing petroleum, whereby not only the light, but the heavier spirits are vaporized, and caused to combine with the water gas. By these means, in conjunction with those described in the specification of a patent, No. 3269, Sept. 24, 1874, the whole of the vaporizable portion of the ordinary petroleum of commerce may be utilized, and the object of the present invention attained. The gas, after passing through the petroleum, may be conducted to a second condenser if necessary, and subsequently to the purifying and storing apparatus in the ordinary way.

4366.—HERRING, R., St. Helen's, "*Improvements in apparatus for securing the lids or covers of gas-retorts.*" Provisional protection only obtained. Dated Dec. 18, 1874.

This invention relates to apparatus to be combined with the lid or cover of a gas-retort to afford the means whereby the same may be securely locked or fastened when closed, and may be readily released and opened, the closing and locking being effected by one movement, and the releasing and opening by another movement of the same lever.

The apparatus is constructed and applied as follows:—To the front of the lid or cover, and at or near its centre, are fixed projecting jaws or lugs of wrought iron or other suitable metal, formed to receive a cross bar, which is pivotted in the jaws. One end of the cross bar is jointed or hinged to a lug or projection on the mouthpiece of the retort at one side of the lid or cover. This pin or joint forms the hinge or pivot whereon the lid is supported and turns in opening and closing. The other end of the cross bar extends to and over a catch or hook fixed on the mouthpiece, and projecting therefrom just clear of the edge of the lid, between the outside of which and the cross bar is placed a taper sliding bar or long wedge. This bar or wedge passes through or between the jaws, and is capable of sliding to and fro therein and upon a plate upon which the jaws are formed or fixed, which plate keeps the bar or wedge clear of the surface of, and extends entirely across the lid, and over the catch. It is operated by a lever or handle, which is fulcrumed or pivotted in the cross bar, and is connected to the sliding bar by a pin joint. A number of holes are formed in the cross bar and sliding bar, so that the lever may be adjusted to compensate for the wearing of the surface of the bars. The catch has on its side adjacent to the edge of the lid an inclined or sloping lip, and on the under side of the sliding bar is a projection, which, when it slides toward the catch, passes up the inclined lip.

The lid is closed by means of the lever, and the cross bar then drops into the catch, the door being secured by continuing to press upon the lever, and thereby moving the sliding bar or wedge toward the hinge or joint of the cross bar. As the sliding bar is thus adjusted it bears with one edge upon the plate on the lid, and with its other edge upon the inner edge of the cross bar, and by reason of its taper or wedge-like form it exerts great pressure upon the cross bar, thereby binding it tightly and securely in the catch.

When the lid is to be opened, the lever is operated to move the sliding bar in the opposite direction. The pressure upon the cross bar is thus relaxed, and as the projection on the sliding bar rides over the inclined lip of the catch the cross bar is raised out of it, and the lid is then free, and may be opened by pulling outward. A stud or stop fixed on the lever comes in contact with the outer edge of the cross bar, and prevents a too great movement of the wedge in either direction.

4386.—SPEIR, R., Greenock, and MATHER, J., Gateshead, "*New or improved apparatus, which may be used for condensing vapours or gases for heating liquids for purifying and bleaching oils and gases, and for other analogous purposes.*" Patent dated Dec. 21, 1874.

This invention consists of a chamber, in which the condensing or other operation is effected by means of a spray, produced by the action of a blast of compressed atmospheric air or steam. The chamber, which is preferably made rectangular, is under one modification, provided vertically with a number of shelves, inclined in opposite directions from each end thereof, and terminated alternately, at a short distance from these ends, thus forming a tortuous or winding passage through the apparatus. The blast of atmospheric air or steam is passed in between the shelves, and its action forms or creates a draught through the chamber. To the pipes, through which the compressed air or steam is conducted to the chamber, branch pipes are attached, which communicate with tanks or vessels containing liquid, which is drawn up from the tanks or vessels by the draught, and forced by the air or steam jet in the form of spray into the spaces between the shelves. The passage, through the chamber, is at one end connected to the pipe-flue apparatus or receptacle containing the gases or fumes and substances disseminated therein, which are to be treated, and at its other end the passage is connected with a chimney. Under another modification the chamber, in lieu of being divided vertically by shelves, is divided horizontally by a series of parallel partitions, extending from top to bottom of the chamber, and terminated alternately a short distance from each end.

4387.—JOHNSON, J. H., Lincoln's Inn Fields, London, "*Improvements in the manufacture of hydrogen gas, and in the utilization of the bye or secondary products obtained in such manufacture.*" A communication. Patent dated Dec. 21, 1874.

This invention relates to the application in the manufacture of hydrogen gas suitable for illuminating and heating purposes, of a material not hitherto used in such manufacture, whereby a considerable saving is effected in the cost of production, and (in the case of lighting gas) greater illuminating power is obtained; and it consists in the employment of the slime or ooze composed of the detritus of floating plants, aquatic vegetables, and the like, which settles on the bed or bottom of rivers, lakes, and similar watercourses or sheets of water, and there collects, forming strata or layers which in a short time become decomposed. The invention also relates to the utilization of the bye or secondary products in the manufacture of coke, artificial fuel, manure, and desinfectants.

4388.—LAKE, W. R., Southampton Buildings, London, "*Improvements in the construction of cylinders for pumps and steam-engines.*" A communication. Patent dated Dec 21, 1874.

This invention relates to a detachable or removable cylinder which is placed with an outer cylinder or casing, with which are combined the valves and passages for admitting and exhausting or discharging the water or steam, and it may be readily removed from the casing, and replaced by another of the same or a different diameter without disturbing the other parts of the pump.

4403.—DAVIS, H. T., New Cross, Surrey, "*Improvements in the construction of traps for sinks, drains, and other conduits for water and other fluids.*" Patent dated Dec. 22, 1874.

According to these improvements, on the top of a cup-shaped cylinder are affixed two circular perforated plates, the upper one revolving on a spring fixed in the centre. Tubes working on spiral grooves or slots are affixed to the lower sides of the perforated plates, and the lower end of the bottom tube is covered with a stop or plate. When by the action of the top perforated plate it is pressed down on the top of a pipe rising from the bottom of the cylinder, it excludes the noxious gases arising from the sewer with which the pipe communicates, at the same time the blank spaces in the upper plate cover the holes in the lower plate.

4404.—MUNFORD, A., South Petherton, Somerset, "*Improvements in apparatus for lighting and extinguishing street and other lamps.*" Patent dated Dec. 22, 1874.

In order that street-lamps may be lighted and extinguished automatically simply by varying the pressure in the main, with each lamp a valve connected with a weighted diaphragm is employed. The diaphragm closes a chamber which is in connexion with the gas supply, and is so weighted that the pressure which is kept in the mains during the daytime is insufficient to lift it, but when the night pressure is let on from the works the diaphragm for each lamp rises, opens the valve, and allows gas to pass out from the diaphragm chamber to the burner. As the gas issues from the burner it is ignited by means of a minute flame, which may be kept constantly burning in immediate proximity to the main burner. This flame is supplied by means of a tube of small bore opening directly into the diaphragm chamber. It is protected from drafts of air by a wind-guard, so that it may not be liable to be accidentally extinguished. The diaphragm chamber is arranged to screw on to the top of the gas supply-pipe, and the burner is mounted on the top of the diaphragm chamber, so that if the apparatus should become deranged at any time it is readily removed and replaced by another in working order, there being no more difficulty in this operation than in changing the ordinary burner nipples.

4410.—KIRKWOOD, J. F., Yeo-Vale, near Bideford, LASCELLES, C. T. E., New Cross, and HALL, J., Peckham, "*Improvements in the construction of gas-engines, and in the adaptation of the same as motors for tramway-cars and similar vehicles; parts of which invention relate to apparatus for driving, adjusting, and locking the wheels of such cars or vehicles, and to brakes for the same.*" Patent dated Dec. 22, 1874.

This invention relates partly to the peculiar construction of engines which are worked by the explosive force of a mixture of gas and atmospheric air, and are designed to be used for various purposes in place of steam and other engines. It also relates to the adaptation of these gas-engines for the propulsion of tramway-cars and other vehicles. The engine may be constructed either in the form of an independent locomotive, which will draw a car or train of cars or carriages after it, or may be incorporated with the structure of an ordinary tramway-car or other vehicle.

4413.—POWELL, J. W., Bermondsey, "*Improvements in apparatus for regulating and controlling the supply and flow of water and other liquids.*" Patent dated Dec. 23, 1874.

This invention consists in improvements in the construction of apparatus and valves or water waste-preventers for regulating and controlling the supply of water to water-closets, urinals, washhand basins, and baths; also in ball-valves for the supply of water to cisterns and otherwise. In the construction of a regulator to be placed under the seat of a water-closet and connected to any ordinary submerged cistern-valve so as to render such valve a waste-preventer. In the construction of a regulator for operating and controlling an ordinary water-closet valve placed under the seat. In the construction of a valve which, when a supply or discharge of water is required, must be first raised and then released, so that such valve cannot be kept open. And in an improved construction of ball valve and cam lever arrangement for working the same.

4420.—WILLIS, H., and BLICK, J., Worcester, "*Improvements in equilibrium slide valves for steam-engines, and engines worked by compressed air, gas, or water.*" Patent dated Dec. 23, 1874.

According to this invention the slide of the valve works steam tight in a flat rectangular channel, the top and bottom plates or seats of the channel having two holes in them corresponding in size, figure, and position with the two induction ports of the slide of the valve. The holes or ports in the top plate are covered by a cap or the end of the pipe which delivers steam to the slide of the valve. When the slide of the valve closes one or both of the induction ports in the plate, the steam presses only on the portion or portions of the slide covering the port or ports, and the steam pressure is hence in great part removed from the slide of the valve. Oil passes by a transverse groove in the top edge of the slide of the valve into vertical grooves in the front and back faces of the slide, whereby the working surfaces are kept steam-tight and the slide of the valve made to work smoothly. The limited pressure described on the slide of the valve may be removed or diminished by the use of an oscillating plate, which when the steam is entering one port closes the hole in the top plate opposite the other port.

4427.—MANN, W. T., Liverpool, "*Improvements in or connected with hydraulic presses and pumps.*" A communication. Patent dated Dec. 23, 1874.

This invention refers to patent No. 3123, dated Oct. 28, 1869, and consists of means for making the grid described in that patent and the end easing doors of the press self-acting. A check safety valve and other arrangements for preventing the recoil and the jumping of the safety-valves of the press pumps is also described, as well as the construction of the valve-boxes of the press and pumps with shifting seats.

4431.—WANKLYN, J. A., Charlotte Street, London, "*Improvements in the purification of water.*" Provisional protection only obtained. Dated Dec. 23, 1874.

The Clark process for softening water although applicable to water the hardness of which is due to bicarbonates of lime and magnesia, is not applicable to water the hardness of which is due to lime and magnesia existing in other states of combination than bicarbonate.

The object of this invention is to extend the application of the Clark process to those other waters to which it is not at present applicable, and this object is attained by the use of carbonate or bicarbonate of soda, or of other soluble carbonates or bicarbonates which will effect the decomposition of the salts of lime and magnesia, and yield carbonates or bicarbonates of lime or magnesia, to which the usual Clark process is then applicable. After having thus treated water containing soluble salts of lime or of magnesia other than or in conjunction with bicarbonate of lime, it is submitted to the treatment of what is known as the Clark process.

It will be evident that the softening process described may be employed either as a preliminary process or in conjunction with the lime or Clark's process, in order that the desired results may be simultaneously obtained.

The amount of soluble carbonates or bicarbonates to be employed for effecting the softening of the water will of course depend upon the amount of the salts of lime and magnesia contained in the water in a form other than that of bicarbonate, and the amount of the carbonates or of bicarbonates employed will be in equivalent proportions to those salts or compounds contained in the water to be treated.

4438.—SAXBY, F. E., Liverpool, "*Improvements in condensers for steam pumping engines.*" Patent dated Dec. 24, 1874.

This invention consists in leading the exhaust steam through an internal pipe in a condensing vessel, and round this internal pipe is fitted a conical-shaped india-rubber valve, which is attached to the condensing vessel below the water inlet orifice, so that the water is sucked by the action of the pump through the space between the valve and the internal pipe, the valve opening to allow the passage of water. The suction-pipe of the pump is attached to the bottom of the condensing vessel, and the pump maintains a vacuum in the condenser according to the strength of the valve.

4486.—HASELTINE, G., Southampton Buildings, London, "*Improvements in the manufacture of enamelled pipes, pipe-couplings, and other articles or apparatus exposed to the action of gases or liquids.*" A communication. Patent dated Dec. 31, 1874.

This invention resides in the discovery that common iron or other pipes used for water or gas, and the fittings, couplings, and elbows used with the same, if coated with an enamelling composition and subjected to the action of sufficient heat to develop the composition into a tenacious coherent and moderately elastic and impervious coating, will possess properties and qualities which especially adapt them for use in conveying water or other liquids or gases, in cases where it is desirable that such pipes and fittings should not injuriously affect the fluid or gases conveyed by them. The invention is also applicable to the portions of pumps which are submerged and to other apparatus exposed to the action of gas or liquid.

APPLICATIONS FOR LETTERS PATENT.

4021.—CANARD, F., and MOUILLERA, C., Paris, "An improved drilling or boring apparatus applicable to sinking artesian and other wells." Nov. 19, 1875.

4028.—MELLING, T., Aigburth, Lancs, "Improvements in modes of and apparatus for regulating pressure in pipes or other conduits." Nov. 20, 1875.

4044.—GRUNDY, G., Tunstall, Stafford, "Improvements in carburetters." A communication. Nov. 20, 1875.

4051.—CAMERON, J., Salford, "Improvements in the construction of steam-pumps." Nov. 22, 1875.

4059.—ARMSTRONG, R., KELLETT, H., and MACFEGGAN, W. S., Durham, "Improvements in pumps and in the apparatus to be used in connexion therewith." Nov. 22, 1875.

4061.—TELLIER, A. LE, Brussels, "Improvements in apparatus for purifying and filtering water and treating sewage." Nov. 22, 1875.

4065.—POTHETOS, A., Greece, "Improvements in apparatus for and in the means of raising water." Nov. 23, 1875.

4068.—SCOTT, J. S., Temple, London, and POILLY, E. DE, Boulogne-sur-Mer, France, "Apparatus for the instantaneous lighting of gas-burners in towns, theatres, public rooms, private dwellings, and other places, applicable also as an automatic gas-gauge." Nov. 23, 1875.

4074.—CROWTHER, A., Bury, Lancs, "Improvements in the connexions of apparatus for withdrawing liquids from store cisterns." Nov. 24, 1875.

4078.—FIRTH, J., Halifax, "An improvement in taps." Nov. 24, 1875.

4083.—THORNELOE, G., Barbican, London, "Improvements in gas, water, and steam valves." Nov. 24, 1875.

GRANTS OF PROVISIONAL PROTECTION.

3850.—BENNETT, J. T. B., Birmingham, "An improved retort, and arrangements of retorts, for manufacturing gas and other purposes." Nov. 5, 1875.

3918.—STOREY, J. H., and STOREY, I., jun., Manchester, "Improvements in self-closing taps or valves." Nov. 11, 1875.

3920.—DEACON, H., Widnes, Lancs, "Improvements in apparatus for exposing porous materials and currents of gases to mutual reactions." Nov. 11, 1875.

3924.—WARDEN, H. W., Bengal, India, "Improvements in apparatus for igniting and extinguishing a number of gas-lamps simultaneously." Nov. 11, 1875.

NOTICES TO PROCEED.

2545.—WILSON, M., Brixton, London, "An improved stench-trap." July 15, 1875.

2557.—GRAUHAN, F. W., Bradford, "Improvements in apparatus employed in the filtration of water, sewage, and other fluids." July 17, 1875.

3739.—CLARK, A. M., Chancery Lane, London, "Improvements in the ventilation and water supply of buildings and apartments." A communication. Oct. 28, 1875.

3758.—PINKERMAN, W. J., Strand, London, "Improvements in lamps." A communication. Oct. 29, 1875.

INVENTIONS PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

3934.—BENNIE, G., Glasgow, "Improvements in retorts and their fittings and appurtenances connected therewith for the distillation of shale, coal, or other oleaginous or bituminous minerals or earths." Nov. 12, 1875.

3978.—BONNEVILLE, H. A., Paris, "A new or improved apparatus for measuring water or other liquids." A communication. Nov. 16, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1955.—LIVESEY, G. T., Old Kent Road, London, "Improvements in apparatus used in the purification of gas." May 28, 1875.

1994.—BROOKES, W., Chancery Lane, London, "Improvements in means or apparatus for conducting and controlling the flow or passage of water, gas, or other fluids or vapours." A communication. June 1, 1875.

2000.—SCHÜSSLER, C. F., Hamburg, Germany, "Improvements in hydrocarbon gas apparatus." June 1, 1875.

2095.—MURDOCH, H. H., Staple Inn, London, "Improvements in the joints of pipes or tubes." A communication. June 7, 1875.

2401.—BANNER, E. G., Billiter Square, London, "Improvements in house traps for preventing the passage of sewer gas into dwellings from sewers, drains, or cesspools." July 2, 1875.

2772.—MILLS, B. J. B., Southampton Buildings, London, "Improvements in liquid-meters." A communication. Aug. 5, 1875.

3137.—YOUNG, W., Clippens, Renfrew, "Improvements in obtaining hydrocarbon vapours from gases, and in the apparatus employed therefor." Sept. 7, 1875.

3221.—CROSSLEY, F. W. and W. J., Manchester, "Improvements in gas motor-engines." Sept. 15, 1875.

3267.—TURNER, S., the younger, J., and R., Rochdale, "Improved means for securing the joints of steam and water pipes, and for other similar purposes." Sept. 18, 1875.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2954.—BAILEY, J., "Improvements in the supply of water to water-closets, urinals, and other places, and in apparatus therefor." Oct. 7, 1872.

2976.—FISHER, W. D., "Improvements in apparatus for, and connected with, the manufacture and use of illuminating gas, parts of which are applicable to other purposes." Oct. 10, 1872.

2991.—ASTROP, W., "Improved means and apparatus for drying sewage and other like substances." Oct. 10, 1872.

3028.—SCOTT, H. Y. D., "Improvements in apparatus for the treatment of sewage." Oct. 14, 1872.

3033.—PONTIFEX, E. A., and BARTON, J., "Improvements in water-waste preventers." Oct. 15, 1872.

3038.—UNDERHAY, F. G., "Improvements in water-waste preventers." Oct. 15, 1872.

3057.—SHEDLOCK, J. J., "Improvements in apparatus for the treatment of hydrocarbon gases and vapours for illuminating and heating purposes." Oct. 16, 1872.

3058.—SHEDLOCK, J. F., "An improved rymer and counter-bore or pin-drill." Oct. 16, 1872.

3093.—WALKER, R., "A new mode or method of applying atmospheric gas, spirituous vapour or gas, and impregnated combustible vapour or gas, as a heating medium for the generation of steam or other purposes." Oct. 19, 1872.

3156.—GOLDSMITH, G., and DILKES, J., "Improvements in apparatus for roasting, baking, or cooking by gas." Oct. 24, 1872.

3192.—VAUGHAN, E. P. H., F.C.S., "Improvements in the mode of and apparatus for generating gas for lighting and heating purposes." Oct. 28, 1872.

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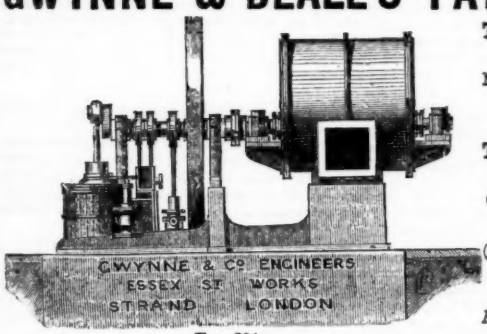

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JOHN SMITH, Manager.
Farnworth Gas-Works, near Bolton.

WANTED, by the Newport (Mon.) Gas Company, an experienced GAS-FITTER.
Applications, stating age, experience, wages required, where last or at present employed, and enclosing copies of testimonials, to be forwarded to me on or before the 9th day of December, 1875.
None need apply whose honesty and sobriety will not bear the strictest investigation.
THOMAS CANNING, Engineer.
Gas-Works, Newport (Mon.), Nov. 27, 1875.

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JAMES BURCH, Secretary.
Secretary's Office, Castle Street, Nov. 19, 1875.

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THE Engineer of a Work of acknow-ledged repute is desirous of LEASING a small work. Can offer unusual advantages to companies or proprietors whose undertakings are unremunerative, or have fallen into a dilapidated condition.
Address No. 202, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO CHEMICAL MANUFACTURERS AND OTHERS.
AMMONIACAL LIQUOR.

THE Directors of the Independent Gas-light and Coke Company are prepared to receive TENDERS for the whole of the AMMONIACAL LIQUOR produced at their works at Haggerston, to commence on the 1st of January, 1876.
Particulars and forms of tender may be obtained on application to Mr. Laing, the Engineer, on the works.
The same must be sent in to me, before Friday, the 3rd of December, endorsed "Tender for Ammoniacal Liquor."
By order,
JAMES B. COULSON, Secretary.
236, Kingsland Road, Nov. 12, 1875.

TO GAS COMPANIES AND OTHERS.

THE Advertiser, who will be shortly disengaged, requires a re-engagement as General Outdoor SUPERINTENDENT of Mains, Meters, &c., and the Fitting up of Public and Private Buildings, or the Management of Stores. Would not object to the management of a small work. The highest references from present situation.
Apply, by letter, to E. W. J., care of Mr. Hopkins, 38, Russell Street, Covent Garden, LONDON.

STOKING MACHINE PATENT FOR SALE; undoubtedly one of the simplest and most effective machines of the kind invented.
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STATION-METER for Sale, in good condition (Makers West and Gregson) in very ornamental case, fitted up with tell-tales, inlet, outlet, and bye-pass valves, and 12-in. connexions. Passes 25,000 cubic feet per hour. Now replaced with a larger one.
For price, &c., apply to JOHN W. WHITAKER, Manager, Gas-Works, WAKEFIELD.

STATION-METER, second-hand, for SALE, with immediate delivery, to pass 1000 cubic feet per hour, in cylindrical cast-iron case, with cast-iron ornamental girder stand, and fitted with water-gauge and plain index. Also valve and connexions. Price, at the Gas-Works, Shanklin, Isle of Wight, £12.
Apply to W. SUTHERLAND, Secretary.

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THE Proprietors are prepared to receive OFFERS for the Wymeswold GAS-WORKS.
The works consist of Retort-House, with a bench of two and a setting of one retort, coal store, a comfortable foreman's house, meter-house, and store shed, together with retort-fittings, condenser, scrubber, two purifiers, meter, governor, and gasholder to contain 5000 cubic feet, or thereabouts, as well as the whole of the mains through the village.
The works are of recent date, in good condition, and are well situated.
The gas and meter rental amount to about £200 per annum, and the consumers are steadily on the increase.
Further particulars to be obtained of Mr. J. B. BALL, Gas-Works, LOUGHBOROUGH.

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GUIDE TO GAS LIGHTING.

By ALFRED H. WOOD, A.I.C.E., Gas Engineer, HASTINGS.

"It is full of sound practical instruction for consumers, and is *an excellent book for Companies to circulate among their customers.*"—JOURNAL OF GAS LIGHTING.

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Tables, Rules, and Useful Information for Gas Engineers, Managers,
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COAL GAS.
By THOMAS NEWBIGGING, A.I.C.E.

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
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These shares are issued under the authority contained in the 23rd section of "The Swansea Gas Act, 1861," and are offered for sale by public auction in pursuance of the 24th section of that Act.
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Sale to commence at (half-past One for) Two o'clock in the afternoon precisely.
Printed particulars may be obtained on application to CHARLES NORTON, Esq., Solicitor, Swansea; the Secretary and Manager of the Company; or at the Auctioneer's Offices, Oxford Chambers, SWANSEA.

NOTICE TO THE PUBLIC.
BRONNER'S IMPROVED SYSTEM IN GAS LIGHTING.

MESSRS. HENRY GREENE AND SON, 155, CANNON STREET, LONDON, sole consignees for Great Britain and Ireland of BRONNER'S IMPROVED SYSTEM IN GAS LIGHTING, beg to inform the public that JULIUS BRONNER, of Frankfort-on-Maine, in the Kingdom of Prussia, Manufacturer, has, of this date, 9th of November, 1875, obtained interdict before the Court of Session in Scotland, against R. M. Brechin and Company, Gas-Fitting Manufacturers, 46, Hanover Street, Edinburgh, and R. M. Brechin, the only known partner of the said firm, interdicting, prohibiting, and discharging the said R. M. Brechin and Company and R. M. Brechin from in any way advertising or offering for sale, or selling, or from in any way causing to be advertised, or offered for sale, or causing to be sold as "Brönner's Burners," any burners not manufactured by the said Julius Brönner, or from in any way endeavouring to induce the public to believe that the said R. M. Brechin and Company, or R. M. Brechin, sell or keep for sale "Brönner's Burners" manufactured by the said Julius Brönner, while such is not the case.
Further, the said Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, instituted by him against a defendant who had been selling such Burners, obtained an injunction perpetually restraining the defendant, his agents, servants, and workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised or offered for sale or sold as "*Real Bronner*," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the plaintiff, Julius Brönner, or by his agents.

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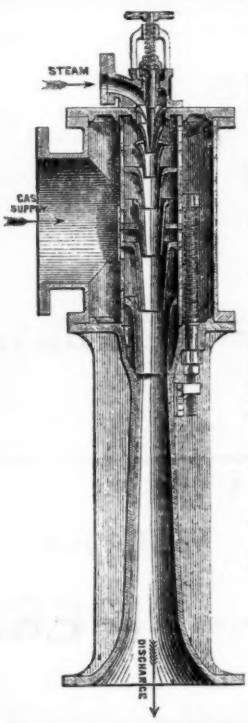

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By Letters Patent in Great Britain, Europe, and the United States of America.

The improvements made during the past three or four years in all the parts of the internal and external construction and machinery of these Scrubbers have rendered them perfect for their work of purification with all kinds of coal, and their cost is less than any other method of completely purifying gas from ammonia.

They contain their own motive power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, **nearly one hundred being in use,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

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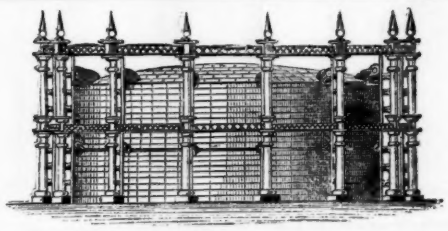

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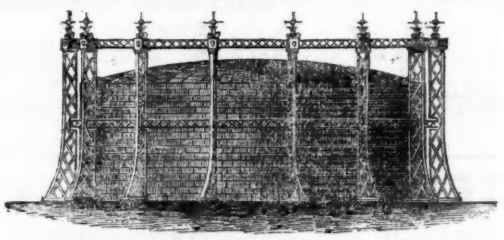

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GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

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GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

OF THE HIGHEST EXCELLENCE;

ALSO LICENSEES AND MANUFACTURERS OF

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ROUND STATION-METERS,

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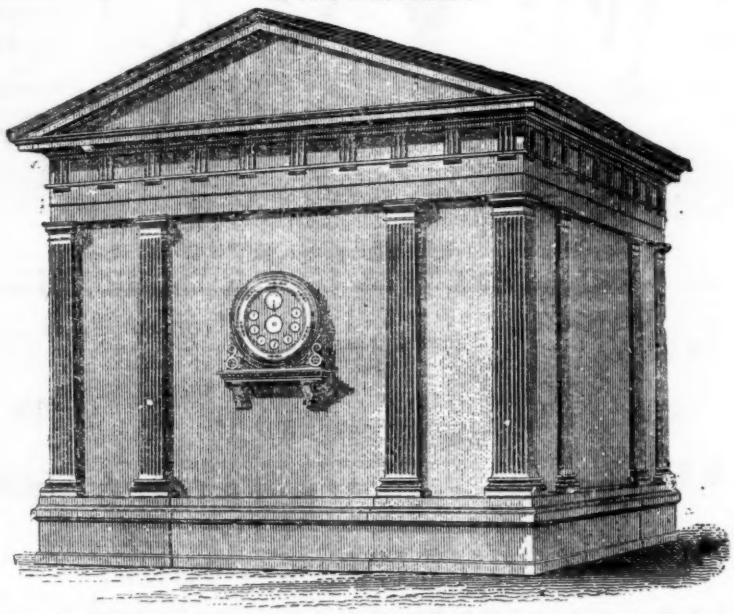

SQUARE STATION-METERS,

WITH PLANED JOINTS.

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GAS COOKING APPARATUS.

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All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

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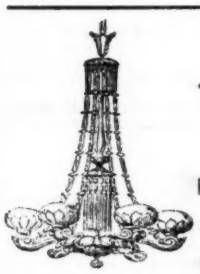

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STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

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"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

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Are prepared to supply and erect their

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Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

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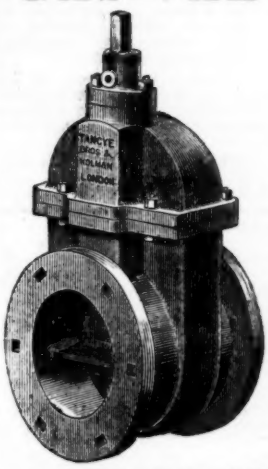

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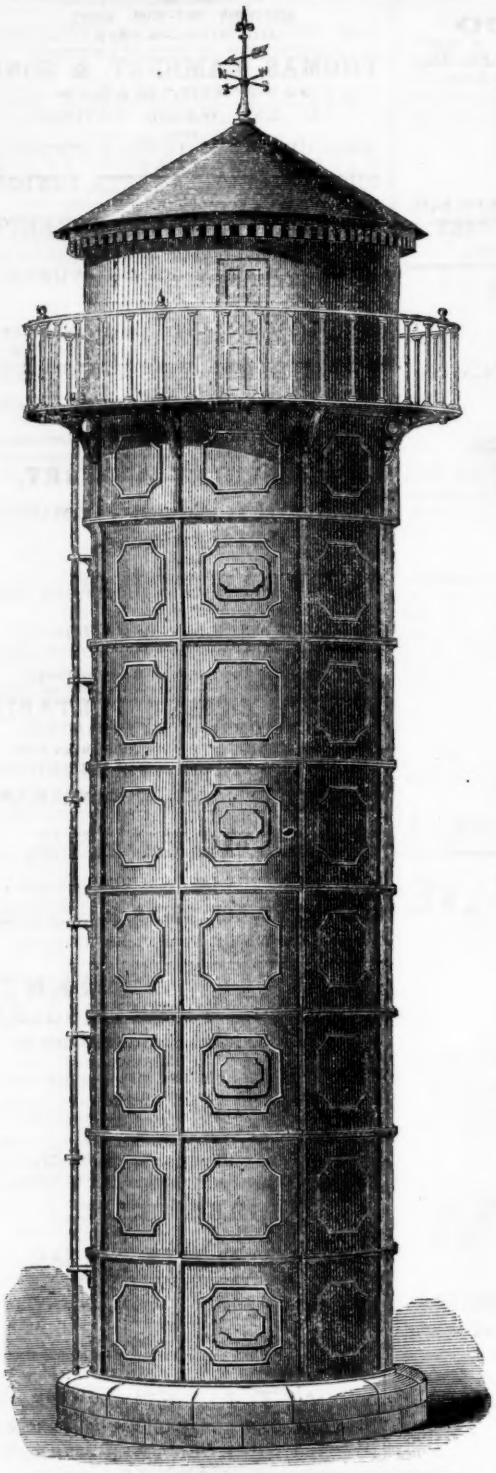
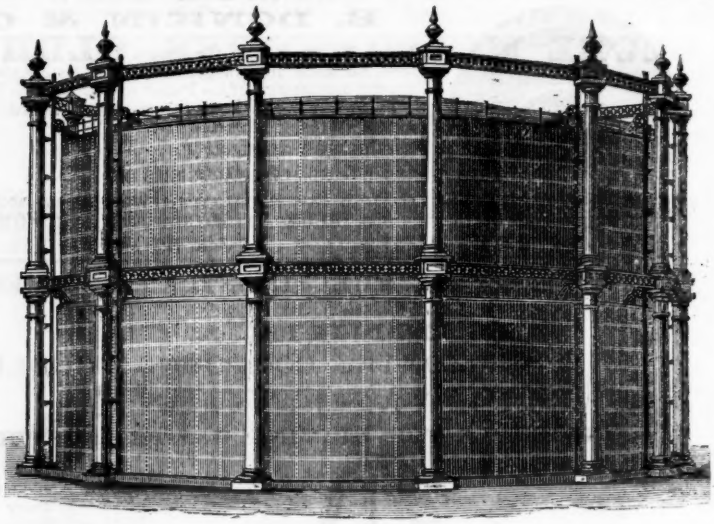


SAME AS ERECTED FOR THE SWANSEA GAS COMPANY.



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EVERY DESCRIPTION OF MACHINERY AND APPARATUS.
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CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
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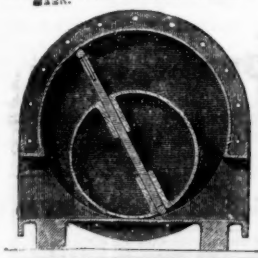
J. BEALE'S PATENT GAS EXHAUSTER.



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MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.

B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

Estimates and Prices on application to

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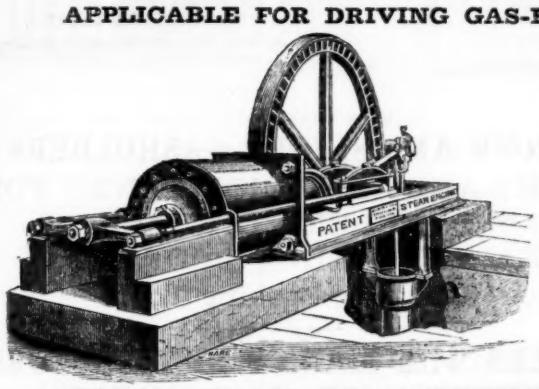
ECONOMY OF FUEL IN STEAM-ENGINES.

B. DONKIN & CO.,

PATENT HORIZONTAL COMPOUND CONDENSING

STEAM-ENGINES,

APPLICABLE FOR DRIVING GAS-EXHAUSTERS.



These Engines have been at work a sufficient number of years to prove their durability and efficiency.

One of them has been subjected to a scientific and exhaustive trial to test the consumption of fuel, with the result that an expenditure of less than 2 lbs. of coal per hour developed one indicated horse power.

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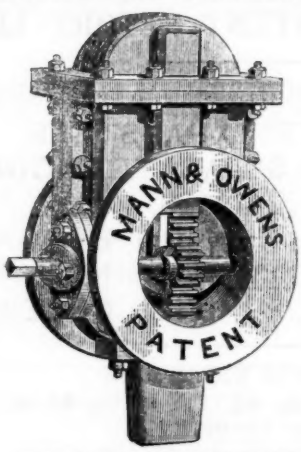
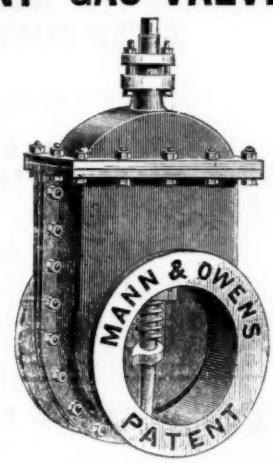


RACK AND PINION VALVE.



SCREW VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

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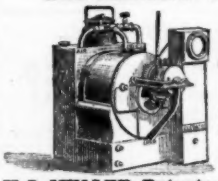

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Specially constructed for Country use.

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No. 3 . . . 60 lights, £55.

Larger and smaller sizes in course of construction.

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PREVENTS WASTE OF GAS FROM RETORTS;

SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;

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And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

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DELIVERY F.O.B. ON CLYDE, OR STOCKTON-ON-TEES.

Prices on application.

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

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Yields 13,320 cubic feet of 32·5-candle gas per ton.
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Of the Abram Colliery Company, are worthy the attention of gas producers, showing a good yield of gas and a large residuum of excellent coke. When blended with one-seventh cannel, the gas is of specially high illuminating power.
Copies of analysis made at the Gas-Works, Salford, with an apparatus of full size, prices, and particulars of
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Supply and Contract for all the principal Scotch Gas Coal (including BOGHEAD, HARTHILL, CHAPELSIDE, LESMAHAGOW, and BRAEHEAD), f.o.b., or delivered at home or abroad.
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Analyses and Prices on application.
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AXWELL COLLIERY COMPANY,
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SUPPLY CANNEL COAL FROM THE ABOVE COLLIERY.
Analysis—10,000 cubic feet of Gas per ton of Coal, having an illuminating value equal to 26 standard sperm candles, with a yield of 13½ cwts. of Coke per ton of Coal.
Supply also Gas and Coking Coals from the best seams.
Shipments at Tyne Dock and South Dock, Sunderland.
FOR PRICES AND FURTHER PARTICULARS,
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POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
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CANNEL COAL MERCHANT,
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Established 1840.

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Scotch Churls
PRESENT PRICE:
5s. 6d. per Ton at Pit.
8s. 9d. ,, F.O.B.

Cubic Feet.	Illuminating Power.	Coke (sup. qual.).
10,000 ..	20 candles. ..	12 cwt.

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WOOD PURIFIER SIEVES,
Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.
MIDLAND IRON-WORKS,
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CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

THE
FRAMWELLGATE COAL COMPANY,
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Are prepared to supply their
SCREENED AND NUT GAS COALS.
This Coal yields 11,000 cubic feet of gas and 13½ cwts. of coke per ton.
OFFICES: ROYAL EXCHANGE, MIDDLESBROUGH.

GAS COAL
Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.
Contracts undertaken for the Shipment, Insurance, and Delivery Abroad of Plant and Materials for Gas and Water Works, &c.
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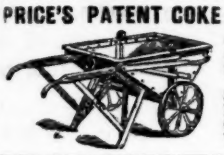
WATER-MAINS.
COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

G. J. EVESON,
GAS COAL MERCHANT,
STOURBRIDGE.
Delivery per Rail to any Part.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY, LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	**10,775**
Weight of coke in lbs. per ton of coal	**1,465**

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE LOCHORE AND CAPLEDRAE CANNEL COAL COMPANY, LIMITED.

Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.		Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	..	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	..	34·83
Value of 1 cubic foot of gas in grains of sperm	780	..	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	..	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	..	71 minutes.
Gravity of the gas (air = 1000)	596	..	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.		Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	..	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	..	33·09
Value of 1 cubic foot of gas in grains of sperm	878	..	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	..	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	..	67 minutes.
Gravity of the gas (air = 1000)	677	..	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

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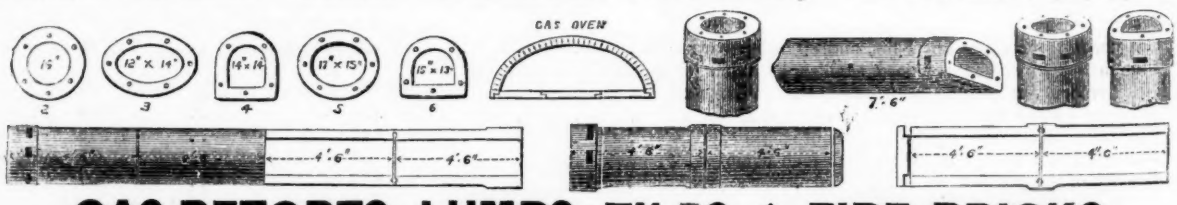

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